DOCUMENT RESUME

ED 139 595 SE 020 749

AUTHOR Miller, Richard L.
TITLE Individualized Instruction in Mathematics: A Review of Research.
PUB DATE Jan 76
NOTE 109p.; M.A. Thesis, University of Maryland; Not available in hard copy due to marginal legibility of original document

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS Achievement; Cost Effectiveness; Elementary School Mathematics; Elementary Secondary Education; *Individualized Instruction; Instruction; *Mathematics Education; Research; *Research Reviews (Publications); Secondary School Mathematics; *Student Characteristics; *Teacher Characteristics
IDENTIFIERS Research Reports

ABSTRACT

After a discussion of the characteristics of individualized instruction, 145 experimental studies of individualized instruction in mathematics, conducted since 1927, are reviewed. Studies are numerically classified on a 5-point scale according to the direction and significance of results concerning students' achievement and attitudes, with the highest score (4) indicating significant results favoring the experimental group. Using these scales, the average differences in achievement and attitude of students are compared on the bases of duration of the study, grade level, initial ability of students, individual differences among students and teachers, and cost factors. Other variables related to some studies were retention, transfer, and development of study skills. Summarizing the studies, the author observes that, in general, research does not support the effectiveness of individualized instruction. However, when specialized problems or objectives are involved, it can be a fruitful instructional approach. (SD)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED139595

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

by

Richard T. Miller

Advisor: Professor James T. Fey

Report submitted to Professor Fey at Florida
In partial fulfillment of the requirements for
the degree of Master of Education.

I recommend that this report be accepted as a
seminar paper required for the Master of
Education degree.

James T. Fey — Date 1/14/76

[illegible] — Date 1/5/76

Maryann Dickson — Date 1/24/76

SE 020 749

Table of Contents

Introduction..... 1
Characteristics of Initial Mathematics Instruction..... 2
Research on Active Student Participation in Mathematics..... 3
Retention..... 7
Transfer..... 8
Time Spent..... 9
Ability Levels..... 9
Rate of Response..... 10
Student Personality Variables..... 12
Teacher Factors..... 14
Peer Influences..... 16
Study Skills..... 17
Cost Factor..... 17
IPI Studies..... 18
The Negative Studies..... 20
The Positive Studies..... 21
The Miscellaneous Studies..... 23
Summary and Recommendations..... 24
Bibliography..... 26
Appendix..... 30

TABLE SUMMARIES

Summary of Table 1 - Research Results..... 5

Summary of Table 2 - Grade Level Distribution for Achievement..... 6

Summary of Table 2 - Grade Level Distribution for Attitude..... 7

Summary of Table 2 - Time Duration versus Grade Level for Positive Studies.. 22

INDIVIDUALIZED INSTRUCTION IN MATHEMATICS:
A REVIEW OF RESEARCH

Introduction

Individualized instruction in mathematics has been and still is a controversial topic among mathematics educators. Articles appearing in mathematics journals as far back as May 1927 discuss what their authors feel are the many pros and cons of this particular teaching approach.[1] Yet today, there is still no real agreement between the two sides on this issue.

What may help is a factual discussion of the issues based on the related research, particularly in light of the fact that there has been a surge of research in this area over the last ten years. Does research support its use? Does individualized instruction actually produce significantly higher results when compared to traditional instruction. What does research actually say about individualizing instruction?

The purpose of this paper, then, is to report the findings of an intensive search of research on individualized instruction in mathematics. It is hoped that the results cited will aid classroom teachers in making their decision to use or not to use the individualized approach in specific situations. It is also hoped that future research in this area may become more focused in the variously discussed essential areas so that the general quality of research in mathematics education may be improved.

---

[1]Wilma Shaffer Flewelling, "A Critical Evaluation of Individualized Instruction in Mathematics," Mathematics Teacher, 20:280-285, May 1927.

Characteristics of Individualized Instruction

A very adequate description of individualized instruction and traditional instruction is given by Gwladys Crosby, et.al.:

> Individualized instruction is defined as that in which each pupil participates in setting his own goals, works at his own rate (either alone or as a member of a small group)...and participates in evaluating his own progress.
> Traditional instruction is defined as all methods in which pupils are taught as a class. It includes homogeneous or heterogeneous grouping and does not preclude the use of audio-visual aids, committee work, or any other techniques traditionally used by teachers to help students learn.[2]

Thus, as in the above definition, individualized instruction has three components: 1) student participation in setting goals, 2) self-pacing, and 3) student participation in the evaluation process. However, within the research on this topic, this definition is modified to varying degrees. For example, some authors do not consider student participation to set initial goals while others feel it is essential. In other studies, student participation in the evaluation process is not considered. Common to all studies, however, is the notion of self-pacing or progression at the student's own rate. Hence for the purpose of this study articles were selected which 1) specifically mention the instructional practice of "individualized instruction" or "the individual technique" in their approach to teaching mathematics, and 2) specifically mention a common element of self-pacing or the concept of students proceeding through the material at their own rate. Studies that used computers to help individualize are not included in this review. It was felt that those studies dealing with CAI (Computer Assisted Instruction) or CMI (Computer Managed Instruction) constituted another major field of research in mathematics instruction and should not be included even though it is recognized that they are somewhat related.

---

[2] Gwladys Crosby, Herbert Fremont, and Harold E. Mitzel. Mathematics Individualized Learning Experiment. 1968. (ERIC: ED 003 558) p. 4.

Research on Individualized Instruction in Mathematics

After an extensive search of research, one hundred and forty-five studies were found to meet the criteria dealing with individualized instruction in mathematics. These studies are summarized in Table 1 of the Appendix. A majority of the studies date from 1969 to 1974, with seventeen studies dating prior to 1960. Eight of these seventeen studies occur during the 1930's, which is probably due to the beginning development of more rigorous methods into educational research and interest in individualized instruction due to the Dalton Plan and the Winnetka School System. Washburne's study, (a follow-up study on the Winnetka School System), is the oldest and was done in 1927. The most popular year for individualized instruction research was in 1972 with twenty-nine studies. Table 3 of the Appendix summarizes the distribution of the studies by year.

There was a wide range of sample size, from thirteen to one thousand seven hundred and sixty-six students, ranging from kindergarden to the college level. A majority of the studies were concerned with the question of whether the individualized instruction method did a better job of improving mathematical achievement over the traditional approach. Quite a few studies were also concerned about the improvement of attitudes towards mathematics. Only a few dealt with other factors such as retention, transfer, self concepts, self esteem, learning rates, or effects on ability levels. For this reason, achievement and attitude are summarized separately in Table 1 of the Appendix.

A large portion of the studies, (31 out of 145 = 21.4%), dealt specifically with one major program, the Individually Prescribed Instruction (IPI) program sponsored by the Learning Research and Development Center associated with the University of Pittsburgh. Table 4 of the Appendix summarizes in brief form the IPI studies.

In order to give an over-all impression of the research, a numerical rating was given to each comparable study on achievement and attitude indicating the

degree to which significant results were found. The numerical scores found in Table 1 are defined as follows:

4 - Significant results in favor of experimental (individualized instruction) group
3 - Mixed results: some significant, some not significant in favor of individualized instruction
2 - No significant results for either individualized instruction or control groups
1 - Mixed results: some significant, some not significant in favor of control group
0 - Significant results in favor of control group

A dash in a column indicates that the factor in question was not considered in the study and comments may appear in the achievement or attitude rating columns of Table 1 where numerical scores could not be assigned.

After each comparable study was assigned a score for achievement and attitude, the scores were then averaged for each so that the relative strength of research support for individualized instruction could be determined. This method of averaging is very similar to finding a grade point average found in many of our educational systems, (A = 4 points, B = 3 points, C = 2 points, D = 1 point, E = 0 points) Possible interpretation of this average could be that an average of 2.0 would mean that there really isn't any difference in the outcome on mathematics achievement or attitude between the individualized teaching method and the traditional method. However, an average of 3.0 (Honors level) could mean that there is a distinct advantage for using the individualized instruction technique in mathematics education.

This averaging technique can also be done in other areas of research in mathematics education such as programmed instruction, use of manipulative materials, use of calculators, etc. Comparison of these measures of research support between the various areas might lead to some interesting hypotheses about the state of research in mathematics education.

However, a word of caution is in order. Are these studies comparable in this fashion? How reliable is the writer's judgment of whether a particular study is

scored properly? While these questions are certainly valid ones, it must be stated that a high degree of objectivity was attempted, and, for want of a better method, this method represents one attempt to interpret an often ambiguous field of research.

The following chart is a summary of Table 1 of the Appendix where the number in each cell of the chart represents the total number of studies that were rated at that particular score for the specific dimension (achievement or attitude) in question. Eighty-eight studies were comparable for achievement and thirty-three were comparable for attitude out of a total of one hundred and forty-five studies.

Summary of Table 1 - Research Results

	SCORE					
	0	1	2	3	4	Total
Achievement	4	10	42	14	18	88 comparable studies
Percent	4.5%	11.4%	47.7%	15.9%	20.5%	100%
Attitude	1	0	25	4	3	33 comparable studies
Percent	3%	0%	75.8%	12.1%	9.1%	100%

Average for achievement = 208/88 = 2.36

Average for attitude = 74/33 = 2.24

Thus, for achievement, 15.9% of the comparable studies are negative, 36.4% are positive, and 47.7% are neutral toward individualized instruction. The average of 2.36, being closer to 2.0 than 3.0, indicates that the individualized approach is just as effective as the traditional approach but does not have a distinct advantage over the traditional. Keeping in mind that almost half of the studies are neutral (42 out of 88), in the remaining half there were more than twice as many positive studies (32) as there were negative (14). This would indicate that when the individualized approach is properly planned and implemented, it could give better results than the traditional.

Three-fourths of the comparable studies for attitude are neutral and it would seem that individualized instruction has limited effect here.

In looking at any field of research, the number of studies with positive results and the number of studies with negative results can give the best indication of the effectiveness of a particular teaching method. A large number of studies with positive results would imply that researchers did determine appropriate learning situations where the particular teaching method is effective. Studying these situations would tell teachers the types of students, the appropriate topics, and other conditions for which a particular teaching method may produce positive results. Similarly, a large number of negative studies would imply that researchers found it difficult to determine appropriate learning situations, and the results of those studies would help teachers to define the limitations of the particular teaching method in question.

In this respect, the research on individualized instruction in mathematics is characterized by quite a few positive studies (32) and a sufficient number of negative studies (14). A discussion of the major positive and negative studies will appear later in this review.

Table 2 of the Appendix indicating the grade level distribution of the studies may be summarized as follows:

Summary of Table 2 - Grade Level Distribution for Achievement

	Scores					
	0	1	2	3	4	Total
Elementary	2	6	37	7	7	59
Junior High	2	3	15	3	7	30
Senior High	-	1	4	3	3	11
College	-	-	6	1	1	8
Total	4	10	42	14	18	88 comparable studies

Summary of Grade Level Distribution for Attitude

	Score					
	0	1	2	3	4	Total
Elementary	-	-	9	1	2	12
Junior High	1	-	9	2	1	13
Senior High	-	-	4	1	-	5
College	-	-	1	1	-	2
Total	1	0	25	4	3	33 comparable studies

Most of the studies occured at the elementary and junior high levels, particularly from fourth grade to Algebra I. (see Table 2 of the Appendix) Evidently it was felt that reading skills had developed sufficiently enough for self-directed learning by the fourth grade and that students in that age bracket (ages 9 to 15) might benefit by this approach to teaching.

The following is a summary of studies where other variables were considered:

Retention

Five studies considered the question of retention. Bazik (1972) and Smith (1972) both found no significant differences with prospective elementary teachers. Hirsch (1972) found no significant difference for retention when comparing a guided discovery method with the individualized method in an Algebra II course. Chatterley (1972) also found no differences for retention when comparing four different self-instructional modes of individualized instruction for a unit on an introduction to integers in seventh grade. Finally, Kontogiannes (1972) did find a significant difference favoring the experimental group with a unit on sets with prospective elementary teachers.

Due to the small number of studies (5), it appears that the question of retention has not been adequately considered in the research on individualized instruction in mathematics. In the area of retention, it would seem that a more self-initiated

type of teaching method, which requires the learner to be more actively involved in the material being learned, should have an advantage over the more passive traditional approach. Certainly, retention is a fertile area for future research in individualized instruction.

Transfer

Only three studies considered the issue of transfer of learning as it relates to individualized instruction. Hirsch (1972) found that the guided discovery group did significantly better than the individualized group for transfer. The remaining two studies did not have a control or traditional group for comparison. Beamer (1970) used fifth graders to teach multiplication of fractions and the students in his study were trained individually and in pairs. The only significant result found was related to intelligence, (the higher the IQ, the higher the incidence of transfer.) Lastly, Lipson (1966) studied transfer and generalization in the Individually Prescribed Instruction (IPI) program. His major conclusion was that the probability of transfer increases as the student's background in arithmetic increases.

Transfer, as with retention, has not been adequately investigated in individualized mathematics programs and is, again, a fertile area for future research.

Time Length

A very interesting result was found when time length (the duration of the experiment) in the individualized mathematics instruction studies was compared to student achievement. Table 5 of the Appendix lists the comparable studies by time length: less than one semester, semester, year, and longitudinal (two or more years). The achievement rating score is listed by the author's name and an average was obtained for each category. Of the 68 comparable studies for achievement, time length for 66 of these studies were indicated. Eight were for less than a semester, nineteen for a semester, twenty-nine for a year in length, and ten

were longitudinal. It seems that as the time length of the individualized instruction studies increases, the achievement average decreases:

Less than a semester average	= 2.75
Semester average	= 2.58
Year average	= 2.24
Longitudinal average	= 2.00

This finding supports a major criticism of individualized instruction programs: that motivation in such programs is difficult to maintain over time and achievement gains tend to become negligible when compared to traditional modes of instruction.

Researchers evidently felt that individualized programs lasting a semester or a year in length would be appropriate time lengths for such programs, (48 studies were in these two categories.)

The distribution of negative studies should also be noted among the four categories: none in the less than a semester category, one in the semester, five in the year, and three in the longitudinal category. Hence, an implication for teachers would be to limit individualized instruction programs to a time length of a semester or less. This, however, shouldn't discourage programs for a year or more since there are an ample number of positive studies in these categories, but it should serve as a word of caution to consider the motivation problem as time increases.

Ability Levels

Thirty-six studies considered effects on various ability levels of students. These studies are summarized in chart form in Table 6 of the Appendix. Nine of these studies cannot be compared because an achievement rating scale could not be ascertained. Twelve studies found that no particular ability group was favored, five studies indicated that high ability students in the individualized

method did better than the high ability students in the control group, seven studies favored the average individualized students, and nine studies favored the low individualized ability students. Two studies stated that the control high ability students did better than the individualized high ability group, and one study indicated that the average group in the control sample did better. The achievement average for the studies listed in Table 6 is 2.41 which is similar to the 2.36 average found for all eighty-eight comparable studies.

These results present a mixed picture concerning the effects of individualized instruction on ability levels. There is probably a correlation between the results for ability levels and the results for student achievement in general. One would expect that if almost half of the studies are neutral on individualized instruction then there would be a large number of studies showing no effect on ability levels. Of the number of studies that did find results for ability levels, there is a minor trend favoring the low ability students: as the ability level decreases from high to average to low, the number of studies favoring the particular ability group increases from 5 to 7 to 9. Thus there is minor support for individualized instruction benefiting low ability students.

Rate of Progress

Only six studies stated specifically that one teaching method was better than another in rate of progress for learning the mathematics material. Three studies, Crandle (1971), Crosby (1969), and Drake (1935), stated that the control group used less time and two studies, Bull (1971) and Fisher, V. (1966) said that the individualized method was faster. Frase (1971), in a study that compared two individualized programs, found that guided discovery units were significantly faster than the Booklets for Individualized Progress (BIP) mathematics program.

There were several other studies that mentioned high ability or highly motivated students in relation to rate of progress. Suppes (1964) had forty high ability first graders finish the first grade mathematics work in seven weeks. Dahlke (1971)

had approximately 21% of 112 students complete an individualized college arithmetic course (a semester course) in twelve weeks or less. The students were characterized by having completed more semesters of Algebra II in high school and having had a higher computation pre-test score than the other students who took a longer time to complete the work. On the other hand, Hanneman (1971) notes that most of the students in a high performance sub-group maintained a pace slower than that of the control group. Lastly, Salzberg (1972) found that free time away from class used as a reward for improved rate of academic progress in math resulted in nineteen of twenty elementary students increasing their rate of progress.

Haddall and Yeager (1965) devoted their entire research project to the investigation of learning rates in the Individually Prescribed Instruction (IPI) program. Their major conclusion was that learning rate is not a general characteristic of the learner but is related to the specific learning task.

Since the research results on this variable appear to be mixed, Eric MacPherson's statement on rate of learning in the May 1972 issue of the Mathematics Teacher is worth noting. Criticizing the concept of the student progressing at his own rate advocated by propondents of individualized instruction, he said:

> There is no such thing as a child's own rate of learning before we have specified the mode of instruction...The rate for children working mainly on their own may be high as compared with that of other modes, but it also may be disastrously low.[3]

It would appear that rate of progress depends on many factors for each individual learner: mode of instruction, difficulty of the learning task, motivation, student ability, etc. With so many variables contributing to the learning rate of one individual student, mixed results for large groups of students is not surprising.

Student Personality Variables

Many studies considered student self-concepts in their investigations of in-

---

[3] Eric D. MacPherson. "How Much Individualization?" Mathematics Teacher, 65:473-476; May 1972.

dividualized instruction. Bradford (1972) found that students' gains were significantly greater for self-concepts in the individualized program. Gaskill (1970), in evaluating the IPI program, found that self-concepts for average and high ability students were not changed greatly, but for low ability students, self-concepts were improved by that program. In two other studies, Manney (1973) and Vorhaus (1971), no significant differences were found for self-concepts between individualized and conventional programs.

Two studies investigated self-esteem. Brust (1972), in doing research on project PLAN (Program of Learning in Accordance with Needs), found no significant differences for self-esteem, but this result was nearly significant (.12 level) in favor of the PLAN group. Schaefer (1972) also found no significant difference for self-esteem, but he observed the fact that very few of the items on the instrument used to measure the student's self-esteem were school related and consequently the method of teaching would have little effect on that variable.

Geddo (1972) found significantly higher results in personal adjustment for the individualized approach at the kindergarden and first grade level. Fallon (1973), however, found no differences in personal adjustment and social adjustment at the elementary level. Smilek and Castro (1969) found that there was little or slight evidence to show that the IPI program reduces inter-student competitiveness or increases self-reliance on the part of students.

Sutton (1967), rather than investigating how individualized programs affect student characteristics, considered the reverse of the question,-how student characteristics affect their progression in individualized programs:

> There is much to suggest that student personality factors greatly influence the rate of progress through the materials... the compulsive child would plod carefully through all the drill materials before attempting a unit test. Other children would characteristically attempt to finesse the procedure by skipping boldly to the test before reading the text materials, much less completing the exercise...the timid or reticent child would not

seek help when it was needed.[4]

Sutton further feels that associated with student personality characteristics is the very important factor of student motivation in the individualized program.

> It is not difficult to imagine that the cycle of drill and failure would soon lead to loss of enthusiasm in the case of the weak student who, having failed a unit test, was faced with repetition of the same type of exercises and drill.[5]

Nelson (1972) investigated the characteristics of the students who did either well or poorly in individualized and traditional programs. His study was conducted at the seventh, eighth, and ninth grade levels and involved the individualized Ginn mathematics program. He found:

> Students who did well in the individualized program possessed a high degree of undisciplined and creative learning style characteristics compared with students who did poorly in the same program.
> A lack of adequate reading skills and the possession of a high degree of undisciplined learning style characteristics apparently did not cause poor performance in the individualized program.
> Students who did poorly in the traditional program apparently possessed a high degree of undisciplined, rigid-inhibited, and acceptance-anxious learning style characteristics.[6]

Neufeld (1967) analyzed differences in personality characteristics between high and low mathematical achievers in the Individualized Mathematics Curriculum Project (IMCP) at the fourth, fifth, and sixth grade levels. His findings were as follows:

> Only 21 cases out of a possible 324 cases were noted in which the high and low achievement main groups exhibited significant differences on the personality characteristics. The majority of these differences favored the high group at the fourth-grade level. The few differences at the sixth-grade level favored the low group...

---

[4]Joseph T. Sutton, Individualizing Junior High School Mathematics Instruction, Final Report, August 1967. (ERIC: ED 016 605) p. 30.

[5]Ibid., p. 30.

[6]Paul Joseph Nelson, Analysis of Attitude, Achievement, and Student Profiles as a Result of Individualized Instruction in Mathematics. (University of Nebraska, 1972.) Dissertation Abstracts International 33A: 3260; January 1973.

> The hypothesis that there was no difference in the personality characteristics among pupils of different levels of mathematical achievement was accepted for the personality variables of self-reliance, sense of personal freedom, feeling of belonging, freedom from nervous symptoms, family relations, and school relations. The null hypothesis was rejected for the personality variables of sense of personal worth, social standards, freedom from withdrawal tendencies, social skills, freedom from anti-social tendencies, and community relations.[7]

Finally, Newman (1974) was concerned with initial attitude differences among successful, procrastinating, and "withdrawn from course" students in a Personalized System of Instruction (PSI) statistics course. The interest factor differentiated the successful group from the withdrawal group, while the procrastinators and the withdrawal groups had feelings of anonymity in their traditionally taught math courses. Newman realized the implication was simplistic: increase the interest in doing mathematics and reduce the feelings of anonymity in order to improve achievement in the program.

It appears that individualized programs are not successful with all types of students. In fact several researchers, Dull (1971) and Fitzgerald (1975), recommend that membership in such programs be voluntary. Malcom (1972) recommends that schools should offer both individualized and traditional programs since some students need the structure of a traditional program. And similarly, Taylor, B. (1971) recommends that such programs be used with students who are highly motivated to learn on their own.

Teacher Factors

The role of the teacher in individualized instruction programs would appear to be vastly different from traditional programs. Research on this topic presents some interesting items for teachers to consider.

7W. Allen Neufeld, Differences in Personality Characteristics Between Groups Having High and Low Mathematics Achievement Within Individualized Instruction. (University of Wisconsin, 1967.) Dissertation Abstracts, 28: 4916; May 1968.

Bowen (1974) found that although the two programs revealed some basic differences, there was no major difference in the methodologies employed by teachers in the two programs. Presenting a different picture, Neujahr (1970) in his study specifically analyzed teacher-pupil interactions in an individualized program. He found that interactions were indeed different from lecture-discussion classes in each of four pedagogical moves considered which were more equally used by teacher and pupils.

Fitzgerald (1967) mentions that the vast majority of the teacher's time was spent in helping students. But Sutton (1967) observed that an inordinate amount of the teacher's time was required to deal with procedural problems in the experimental classes. As a possible solution to this, Bailey and Denemark (1969) recommend computerizing the management of such programs to enable teachers to spend more time assisting students with learning and less time correcting papers or telling students what to do next.

Zahorik (1969) observed five individual and four group mathematics lessons taught by the same teacher. He found that:

> During individual instruction there was more teacher talk, less use of higher thought level solicitations, and less use of a variety of logical operation solicitations than during group instruction.[1]

Zahorik's results should serve as a word of caution for teachers to be aware of their behavior in individualized programs so they do not exhibit behavior which might undermine the goals of individualized instruction.

Sutton (1967) notes another tendency on the part of teachers:

> The teachers became increasingly lenient with marks on the unit tests and increasingly demanding on the number of units a student should pass. This phenomena probably reflected both a desire to give students a sense of progress, as well as a compulsion to see that the students 'covered the material.'[2]

---

[1] John A. Zahorik. "Individual Instruction and Group Instruction: A Case Study." Journal of Educational Research, 62: 459, July-August 1969.

[2] Sutton, op.cit. p. 39.

Sutton further presents on personality characteristics as being important:

> Personality characteristics of both teachers and pupils influenced the progress of the pupils with the experimental materials. Teachers with relatively high personality test scores in 'orderliness' and 'dominance' had the more successful classes as measured by gains in arithmetic fundamentals. Teachers with relatively low scores in 'exhibitionism' had classes with better gains in arithmetic reasoning.[20]

Finally, two research studies commented on the time teachers spend on individualized programs. Nix (1969) stated that teachers spent more time in out-of-class preparation for individualized instruction than for group-oriented instruction. And Neuhaus (1964) mentioned that a major limitation was the time required (about two hours each day) to grade the number of papers that needed checking.

Sex Differences

Twenty studies considered possible differences between boys and girls in their investigations related to individualized instruction. These studies are summarized in Table 7 of the Appendix. Eleven reported no differences between boys and girls, and one study (Zenchenen) is not comparable with the others. Five studies reported differences within the individualized group with three favoring girls, (Perney, Fitzgerald, and Neujahr), and two favoring boys, (Clough and Snyder). Three studies found that a particular sex in the individualized group did better than the corresponding subgroup in the control group. Two of these studies favored boys, (Walborn and Nix), and one study favored the girls (Wrigley). Lastly, one study (Perney) found that the control boys did better than the individualized boys.

The above results indicate that there is indeed no real difference between boys and girls related to individualized instruction programs.

---

[20]Ibid., p. 41.

Study Skills

Three studies investigated study skills. Crangle (1971) found no significant difference in work study skills achievement between control and experimental groups. Thurston (1972) likewise found no significant differences for study habits and study attitudes between IPI and non-IPI students. However, for study attitudes near significance was obtained at the .08 level. Finally, Norris (1968) found significant results favoring the conventional method for study habits and attitudes, critical thinking, and library skills.

Cost Factor

Only six of the studies on individualized instruction mention the cost of running such a program and they present a mixed picture. Heiman (1970) stated that individualized instruction is economically feasible for school systems. Costs for instructional materials in the IPI study by Meade and Griffin (1969) steadily decreased over a four year period while Taylor and Florine (1972) found that over a three year period the cost of the IPI program increased by fifty-eight percent. McDermott (1973) stated that traditional instruction would cost about $53 per student while an audio-tutorial system would average about $22 per student over a five year period. Anplace (1973), however, found that Individual Learning Units were more costly but they did produce superior achievement gains over the traditional approach. Finally, Pigge (1972) compared three types of individualized instruction and found that a technological approach (one teacher, one teacher aide, and programmed materials with thirty teaching machines) was most expensive, a team-teaching approach was less expensive, and a self-contained, one teacher individualized approach had the best cost factor. He states:

> ...that the 'best' method (of those under consideration) -- in terms of achievement and cost-benefit is that of a dynamic, enthusiastic, well-versed teacher with a heterogeneous class of pupils of size 30

or less.[11]

Fleer's study indicates that it is possible to have a successful individualized program without being expensive, but he also implies that the key to that successful program is the teacher who implements the program.

IPI Studies

As mentioned earlier, the studies dealing with the Individually Prescribed Instruction (IPI) program developed by the Learning Research and Development Center associated with the University of Pittsburgh constituted a large portion (31 out of 145 = 21.4%) of the studies found on individualized instruction. These studies are listed in Table A of the Appendix. They date from 1965 to 1973, are predominantly at the elementary level, and represent the latest concentrated effort to develop and to evaluate an individualized instruction program in mathematics.

Characteristics of the IPI program are: 1) objective oriented curriculum arranged in eighty-five units covering the mathematics material in grades one to eight, 2) diagnostic testing of individual students on the objectives of each unit, 3) teacher prescription of work to be done and the materials to be used based on the results of the diagnostic test, and 4) post-testing of students to determine mastery with additional work assigned if mastery is not obtained. Due to the volume of paper grading and prescription writing, teacher aides, parent volunteers, and student teachers are often employed to assist the classroom teachers.

The overall achievement average for the IPI studies is 1.85 which is not too encouraging. Two studies, Clough (1971) and Harper (1972), had positive results in achievement while four studies, Bailek and Castro (1969), Fielder (1971), Thomas (1972), and Verhoul (1971), had negative results in achievement. However, two of these negative studies (Bailek and Castro, and Thomas) had positive implications

---

[11] Fred L. Fleer and others. Final Evaluation Report, Exemplary Middle School Mathematics. Bowling Green State University, Ohio, August 1970. (ERIC: ED 077 267) p. 222.

in attitude for the IPI program.

Bailek and Castro made some interesting observations on teacher implementation of the IPI program:

> Clearly, the teachers involved almost unanimously like IPI and believe it to meet the goal of individualization of instruction. They recognize the change in their role, the need for clerical aid, and the general enthusiasm of their students. We found, however, a fairly rigid, and at times, erroneous interpretation of what the IPI program actually is as envisioned by its developers. This is partly reflected in the student activity checklist... where IPI students are either working by themselves on a worksheet, waiting for assistance, or doing nothing. There is little, if any, flexibility on the part of teachers in breaking away from this pattern: teachers who conducted true group or seminar sessions were in the minority. Our impression, in general, was that teachers equated IPI with each child working on his worksheet...It would seem that teachers need to be encouraged to vary their methods more and that IPI is not synonymous with the individual worksheet.
> A more serious concern on this topic, however, is the clear tendency for teachers to let the pre-established IPI continuum determine the prescription...The content of the prescription is basically determined by the child's achievement...and is rarely influenced by any individual characteristics of the child--his interests, styles, etc.
> ...It seems to us that teachers should be encouraged to deviate more frequently and freely from the prescribed IPI continuum in assigning work to students.[12]

Hence an important factor to keep in mind for the success of any program is the know-how and enthusiasm of the classroom teacher. The mechanical implementation of the IPI program taught by elementary teachers who may not be enthusiastic about mathematics or trained in mathematics could be the major cause of the negative results in the four studies mentioned.

Even though the achievement results for the IPI studies is slightly below average, there is another contribution worthy of mention. Many of the studies investigated other aspects of the individualized instruction process other than only achievement and attitude results. For example, Bolvin (1966) found that variability of achievement within a particular grade approximates the number of years the pupils have been in school. Lipson (1966) found that the probability of transfer increases as the student's background in arithmetic increases. Bean-

---

[12] Milton L. Bailek and Barbra Castro. A Second Year Evaluation of Individualized Prescribed Instruction (IPI). Research for Better Schools, Inc., Philadelphia, Pennsylvania, 1970. (ERIC: ED 036 157) pp. 58-59.

lon (1966) investigated self-initiated behavior and found that a highly individualized classroom environment does encourage that type of behavior. Lindvall and Yeager (1965) investigated the rate of learning and reported that it is not a general characteristic of the learner but that it is related to the specific learning task. Weinberger (1969) found that it was unnecessary to take placement tests in the fall after a summer recess. Other studies investigated prescription writing, DeRemzie (1970), Gruber (1974), and Nolte (1972); self-scoring behavior, Cleo (1971); and observation methods, Kissel (1970).

The Negative Studies

In discussing the characteristics of the negative studies, it is important to keep in mind a logic theorem from high school geometry: the converse of a true statement is not necessarily true. Hence if the negative studies have certain characteristics then any study having those characteristics need not necessarily be negative. However, the existence of such characteristics should serve as a precautionary indication for teachers considering such a program.

First, as mentioned earlier, time duration is a potential factor in negative results. Of the fourteen studies with negative results, five were a year in length and three were longitudinal (see Table 8). A possible explanation may be that motivation in such programs is difficult to maintain over time, especially without the social interaction of the participating students.

Second, ten of the fourteen studies were at the 5th, 6th, 7th, or 8th grade levels (see Table 8). Several studies, Amendola (1973), Wanden (1971), and Verheul (1971), mentioned computational or arithmetic skills as the area in which the control group did better than the individualized group. Since learning computational skills is the heart of the curriculum at these grade levels, a more traditional approach emphasizing these skills may be in order. Using the individualized approach for remediation of computational skills starting at grade nine appears to be more successful: Daley and Dunsheath (1960) and Bernstein (1966).

Third, large sample size is reported by nine of these fourteen studies. Seven had sample sizes larger than 270 students, one involved eight schools, and the other involved two schools. Certainly, large sample size is ideal for research studies, but with increased sample size the researcher loses direct control over the experimental situations and programs for the various treatment groups may not have been properly implemented.

The following studies are recommended for detailed reading by those interested since they describe individualized programs that produced negative results and should help anyone who is planning to implement an individualized program in the future. Fitzgerald (1965) made detailed observations of students involved in self-selected activities and makes some valuable recommendations. Sutton (1967) describes personality characteristics and motivational problems in a junior high individualized program. Dailek and Castro (1969) accurately evaluate the IPI program in four elementary schools and compare them with four conventional schools. And finally, Crosby (1960), who obtained neutral results in a ninth grade Algebra I individualized program, is worthy of note because of insightful observations and recommendations.

The Positive Studies

The thirty-two positive studies are distributed with fourteen at the elementary level, ten at the junior high level, six at the senior high level, and two at the college level. It would seem that one could find a positive study for individualized instruction at almost any grade level in the mathematics curriculum (see Table 2). Certainly there is ample research support for the use of individualized instruction programs if they are properly planned and implemented. However, one should keep in mind that these thirty-two studies only represent 36.4% of the eighty-eight comparable studies, while 47.7% were neutral and 15.9% had negative results.

Table 9 of the Appendix summarizes in brief form the positive studies on individualized instruction. Twenty-three of these positive studies gave time durations and the following summary chart compares time duration with grade level.

Summary of Table 2 - Time Duration versus Grade Level for Positive Studies

	Less Than A Semester	Semester	Year	Longitudinal	Total
Elementary	1	3	4	-	8
Junior High	-	3	4	1	8
Senior High	1	1	2	1	5
College	2	-	-	-	2
Total	4	7	10	2	23

Hence most (14 studies) of the twenty-three studies are concentrated at the elementary and junior high school levels and are either a semester or year in length. From the previous discussion of the negative studies it appears that the elementary-junior high level with a time duration of a year has not only a large portion of the successful studies but a large portion of the unsuccessful ones as well. This would imply that there are difficulties for individualized instruction programs at that level but that those difficulties can be overcome. The only question for the teacher to consider would be a judgmental one involving time, effort, expense, motivation of students, etc.

In contrast to the negative studies, a majority (17 out of 32) of the positive studies had sample sizes of 250 students or less. The sample sizes listed in Table 9 of the Appendix appear to be sufficient and it would seem that sample sizes from 30 students up to 250 students give researchers adequate control over the experimental situation.

Some positive studies worthy of careful reading are Bernstein (1956) and Guiler and Edwards (1943) because of their work with individualized instruction in computational skills. Both studies analyze in detail the types of computational errors made by students. Finally, Broussard (1971) should be considered because of his multi-approach in which he used individually prescribed work through independent study, small group discussions, teacher-led discussions, and large group activities.

Two Miscellaneous Studies

In conclusion, two studies worthy of mention are by Acquaviva (1973) and Pond (1973).

Acquaviva did a survey of the high schools in New Jersey and gives an indication of the frequency of use of individualized instruction. He obtained a 100% response to a questionnaire sent to 260 high schools and found that ability grouping was used in 82.7% of the schools and that one-fifth of the schools reported programs of individualized instruction involving 7.5% of the enrolled students. The two courses most frequently individualized were general mathematics and algebra.

Pond investigated the philosophical and psychological basis for implementing the concept of an individualized approach in education and concluded that there does exist a creditable body of knowledge in support of individualized instruction. He also conducted a study on the attitudes toward individualized instruction of prospective elementary teachers studying under this approach and found that the fact they had personal experience with this approach did have a significant positive effect upon their attitudes toward individualized instruction.

Summary and Recommendations

One hundred and forty-five studies, ranging from the kindergarden to the college level, were found dealing with various aspects of individualized instruction in mathematics. Eighty-eight studies were comparable in achievement in the sense that they compared an individualized instruction group with a control or traditional instruction group. Thirty-three were comparable in mathematics attitude. To facilitate comparison and to determine the relative strength of research support for individualized instruction, a numerical score (using a 0-4 point scale similar to a grade point average) was given to each comparable study for the factors of achievement and attitude and an over-all average was obtained. These findings, as well as others of note, are as follows:

1) The achievement average for individualized instruction is 2.36 with 47.7% of the comparable studies being neutral, 36.4% being positive, and 15.9% being negative. This implies that the individualized approach, when properly planned, is an effective approach and does have research support. However, caution and proper planning is needed due to the 15.9% negative studies.

2) The attitude average is 2.24 with 75.8% of the comparable studies being neutral, 21.2% being positive, and 3% being negative. Since three-fourths of the comparable studies are neutral, it would seem that individualized instruction has limited effect on attitudes.

3) The fourteen negative studies in achievement are characterized with a majority being at the fifth to eighth grade levels, large sample size (above 270 students), and a time duration of a year or longer in length.

4) The thirty-two positive studies in achievement are characterized with a majority being at the elementary or junior high school levels, smaller sample size (under 270 students), and had a time duration of a semester or year in length.

5) The Individually Prescribed Instruction (IPI) program developed by the Learning Research and Development Center associated with the University of Pittsburgh con-

stituted a large portion (31 out of 145 = 21.4%) of the studies. These studies were primarily at the elementary school level and date from 1965 to 1973. Thirteen of these studies were comparable in achievement and had an average of 1.85 which is slightly below a neutral score of 2.0.

6) Five studies considered retention with four finding no difference and one finding positive results with prospective elementary school teachers.

7) Only three studies considered the variable of transfer of learning as it relates to individualized instruction. One study found that a guided discovery group had significantly better transfer scores than an individualized group, while the other two studies did no comparisons but found that transfer is increased with higher intelligence and a greater background in mathematics.

8) Thirty-six studies mentioned ability levels with twenty-one of those studies being neutral or not comparable. In the remaining studies there was a very minor trend favoring low ability students in individualized instruction programs.

9) Twenty studies considered possible differences between males and females related to individualized instruction programs but found no real differences between them.

10) Six studies considered cost factors and their results were contradictory.

11) Six studies gave some results on rate of progress or whether one method was more expedient in helping students learn the mathematics material. Mixed results were reported.

12) Personality considerations were reported in fifteen studies with several recommending that individualized programs are not successful with all types of students.

13) Only three studies reported results on study skills with two studies stating that there were no differences while one study favored the conventional method.

14) Several researchers considered teacher factors in implementing individualized instruction programs. Some factors to be considered by teachers in such programs that may become burdening are the time spent on procedural matters and the clin-

necessary to grade papers and keep records.

15) A major finding of this review of research was the steady decline of achievement results in individualized instruction programs as time length or duration of the studies increased. Sixty-six studies reported time lengths with eight being less than a semester, nineteen for a semester, twenty-nine for a year, and ten were longitudinal. Thus 73% of these sixty-six studies were for a semester or year in length. But with most of the negative studies in the year or longitudinal categories, an implication would be to limit individualized instruction programs to a semester or less. However, this is only a precautionary measure as there are many positive studies for a year or longer in duration.

16) Teacher enthusiasm and teaching skill greatly affect the implementation of individualized programs in mathematics.

The following are recommendations for future areas of research:

1) More in-depth studies are needed to determine the effect of individualized programs on retention and transfer.

2) Studies are needed to determine the effect on achievement in individualized programs for the variables of student participation in setting goals and student participation in the evaluation process.

3) A review of research needs to be done concerning the use of the computer in conjunction with the individualization of instruction.

4) Due to the minor trend favoring the low ability students in individualized programs, further research on ability levels are needed to clarify this issue.

5) Future studies on attitude should differentiate between positive attitudes towards mathematics and positive attitudes towards the individualized process itself.

6) Follow-up investigations on the IPI program should be done to determine if improved results are obtained.

7) Studies are needed to determine the effects on students of teachers who take graduate or in-service courses on or using the individualized approach.

c) Research is needed in the area of training of student teachers in the use of the individualized approach to determine whether such training affects their teaching skills.

Thus, in conclusion, research in general does support the use of individualized instruction in mathematics. However, possible problems such as motivation, lack of student interaction, time limitations, increased expense, difficulties in obtaining appropriate materials, etc., may need to be overcome in order to have a successfully operating individualized instruction program. Nonetheless, the possible benefits, such as increased achievement in some instances, may make overcoming these potential problems worthwhile.

BIBLIOGRAPHY

BIBLIOGRAPHY CONTENTS

Books..... 30

Research Summaries..... 30

Other Sources of Research..... 30

Research on Individualised Instruction..... 32

References..... 43

BIBLIOGRAPHY

Books

Duker, Sam. Individualized Instruction in Mathematics. The Scarecrow Press, Inc., Metuchan, New Jersey. 1972, 423p.

Howes, Virgil M. Individualizing Instruction in Science and Mathematics, Selected Readings on Programs, Practices, and Uses of Technology. The Macmillan Co., New York, 1970, 204p.

National Society for the Study of Education. Adapting the Schools to Individual Differences. Twenty-fourth Yearbook, Part 2, Bloomington, Illinois Public School Publishing Co., 1925, 388p.

National Society for the Study of Education. Individualizing Instruction. Sixty-first Yearbook, Part I, Chicago: University of Chicago Press, 1962.

Research Summaries

Bernstein, Allen. "Library Research-A Study in Remedial Arithmetic." School Science and Mathematics, 59: 195-195; March 1959.

Douglass, Harl R. "Experimental Studies of Large Unit and Individualized Plans of Supervised Study of Secondary School Mathematics." Mathematics Teacher, 29: 387-389; December 1936.

Peters, Charles C. "An Example of Replication of an Experiment for Increased Reliability." Journal of Educational Research, 32: 3-9; September 1938.

Suydam, Marilyn N. and Weaver, J. Fred. Individualizing Instruction, Set A, Using Research: A Key to Elementary School Mathematics. Pennsylvania State University, Center for Cooperative Research with Schools, April 1970. (ERIC: ED 038 318; 8p.)

Suydam, Marilyn N. A Review of Research on Secondary School Mathematics. ERIC Information Analysis Center for Science, Mathematics and Environmental Education. March 1972. (ERIC: ED 065 313; 230p.)

Other Sources of Research

Riedesel, C. Alan. "Recent Research Contributions to Elementary School Mathematics." Arithmetic Teacher, 17: 245-252; March 1970.

Suydam, Marilyn. Research on Elementary Mathematics, PME XI. Pennsylvania State University, 1970. (ERIC: ED 034 087; 62p.)

Suydam, Marilyn N. Interpretive Study of Research and Development in Elementary School Mathematics, Volume I: Implications for Curriculum and Research. Pennsylvania State University, June 30, 1970. (ERIC: ED 039 014; 233p.)

Suydam, Marilyn N. Interpretive Study of Research and Development in Elementary School Mathematics, Volume 2: Compilation of Research Reports. Pennsylvania State University, June 30, 1969. (ERIC: ED 030 017; 331p.)

Suydam, Marilyn N. Annotated Compilation of Research on Secondary School Mathematics, 1920-1969, Volume 2: Investigations, Compilation of Articles. Pennsylvania State University, February 1972. (ERIC: ED 062 165; 407p.)

Suydam, Marilyn N. Annotated Compilation of Research on Secondary School Mathematics, 1920-1969, Volume 3: Compilation of Dissertations, Summary and Conclusions, Final Report. Pennsylvania State University, February 1972. (ERIC: ED 062 166; 431p.)

Suydam, Marilyn N. "Research on Mathematics Education, Grades K-8, for 1969." Arithmetic Teacher, 17:511-527; October 1970.

Suydam, Marilyn N. Using Research: A Key to Elementary School Mathematics, The Research From 1970: What Did It Say? (ERIC) Information Analysis Center for Science, Mathematics, and Environmental Education, Columbus, Ohio. (ERIC: ED 049 078; 8p.)

Suydam, Marilyn N. and Weaver J. F. "Research on Mathematics Education (K-12) Reported in 1970." Journal for Research in Mathematics Education, 2: 257-298; November 1971.

Suydam, Marilyn N. and Weaver, J.F. "Research on Mathematics Education (K-12) Reported in 1971." Journal for Research in Mathematics Education, 3: 196-238; November 1972.

Suydam, Marilyn N. and Weaver, J.F. "Research on Mathematics Education (K-12) Reported in 1972." Journal for Research in Mathematics Education, 4: 205-242; November 1973.

Suydam, Marilyn N. and Weaver, J.F. "Research on Mathematics Education (K-12) Reported in 1973." Journal for Research in Mathematics Education, 5: 238-272; November 1974.

Research on Individualized Instruction

Abato, Charles Edwin. An Evaluation of an Individualized Educational System in an Elementary School. (Columbia University, 1972.) Dissertation Abstracts International, 33A:4234; February 1973.

Acquaviva, Vincent Michael. Provisions for Individual Differences in Mathematics Instruction in the Public High Schools of New Jersey. (Rutgers University, 1973.) Dissertation Abstracts International, 34A:4074; January 1974.

Alschuler, Alfred S. "The Effects of Classroom Structure on Achievement Motivation and Academic Performance." Educational Technology, 9: 19-24; August 1969.

Amendola, Anthony A. Changes in Attitude and Achievement Effected by a Continuous Progress Education Program at the Elementary School Level. (Arizona State University, 1973.) Dissertation Abstracts International, 33A:4702; March 1973.

Arrants, Glen Clyburn. An Individually Prescribed Instructional Program Using Behavioral Objectives with Primary Educable Mentally Retarded Children. (Duke University, 1972.) Dissertation Abstracts International, 33A:4973; March 1973.

Bailek, Wilton M. and Castro, Barbra. A Second Year Evaluation of Individualized Prescribed Instruction (IPI). Research for Better Schools, Inc., Philadelphia, Pennsylvania, 1969. (ERIC: ED 036 157; 80p.)

Bailey, John D. and Benesch, Mary P. A System for Individualized Math Instruction in Secondary Schools. July 1969. (ERIC: ED 050 555; 9p.)

Ball, Linda Virginia. Student Contracting for Achievement Grades in Ninth Grade General Mathematics. (University of Connecticut, 1973.) Dissertation Abstracts International, 34A:206; July 1973.

Banghart, Frank W. and Spraker, Harold S. "Group Influence on Creativity in Mathematics." Journal of Experimental Education, 31: 257-263; March 1963.

Bartel, Elaine Vetter. A Study of the Feasibility of an Individualized Instructional Program in Elementary School Mathematics. (University of Wisconsin, 1965.) Dissertation Abstracts, 26:5284; March 1966.

Bazik, A. Matthew. Evaluation of a Plan for Individualizing Instruction Through Informing Students of Behavioral Objectives in a Mathematics Course for Prospective Elementary School Teachers at Elmhurst College. (Northwestern University, 1972.) Dissertation Abstracts International, 33A: 5594; April 1973.

Beamer, Robert Harlan. Transfer After Training with Single vs. Multiple Tasks by Individuals and Pairs of Low and High Ability Fifth Graders. (Illinois State University, 1970.) Dissertation Abstracts International, 31A:2930; December 1970.

Bernstein, Allen L. "A Study of Remedial Arithmetic with Ninth Grade Students." School Science and Mathematics, 54: 25-32; January 1956, and 56: 429-438; June 1956.

Boul, Bobbie Thatcher. An Evaluative Study of Teaching Seventh-Grade Mathematics Incorporating Team Teaching, Individualized Instruction and Team Supervision Utilizing the Strategy of Learning for Mastery. Dissertation Abstracts International, 34A:4685; February 1974.

Bierden, James Edward. Provisions for Individual Differences in Seventh Grade Mathematics Based on Grouping and Behavioral Objectives: An Exploratory Study. (University of Michigan, 1968.) Dissertation Abstracts International, 30A:196-197; July 1969.

Bierden, James Edward. "Behavioral Objectives and Flexible Grouping in Seventh Grade Mathematics." Journal for Research in Mathematics Education, 1: 207-217; November 1970.

Bolvin, John O. Variability of Pupil Achievement in Mathematics. University of Pittsburgh, Learning Research and Development Center, 1968. (ERIC: ED 039 129; 15p.)

Bowen, Robert Lee. An Evaluative Study of an Individualized Math Team Program. Dissertation Abstracts International, 34A:6349; April 1974.

Bradford, Equilla Forrest. A Comparison of Two Methods of Teaching in the Elementary School as Related to Achievement in Reading, Mathematics, and Self-Concept of Children. (Michigan State University, 1972.) Dissertation Abstracts International, 33A:4786; March 1973.

Bradley, Richard N. An Experimental Study of Individualized Versus Blanket-Type Homework Assignments in Elementary School Mathematics. (Temple University, 1967.) Dissertation Abstracts, 28A:3874; April 1968.

Brender, Cecilia Colette. The Application of Diagnostic Teaching and a Mathematics Laboratory to a Middle School Individualized Unit on Fractions. (University of Pittsburgh, 1973.) Dissertation Abstracts International, 34A:1579; October 1973.

Broussard, Vernon. The Effect of an Individualized Instructional Approach on the Academic Achievement in Mathematics of Inner-City Children. (Michigan State University, 1971.) Dissertation Abstracts International, 32A:2999-3000; December 1971.

Broussard, Vernon; Fields, Albert; and Reusswig, James M. "A Comprehensive Mathematics Program." Audiovisual Instruction, 14: 43-44, 46; February 1969.

Brust, Joseph Vincent. The Relationship of Individualized Instruction in Learning Skills to Self-Esteem and Achievement. (Columbia University, 1972.) Dissertation Abstracts International, 33A:97; July 1972.

Bull, Scott Spencer. A Comparison of the Achievement of Geometry Students Taught by Individualized Instruction and Traditional Instruction. (Arizona State University, 1971.) Dissertation Abstracts International, 31A:4616-4617; March 1971.

Chatterley, Louis Joseph. A Comparison of Selected Modes of Individualized Instruction in Mathematics for Effectiveness and Efficiency. (University of Texas at Austin, 1972.) Dissertation Abstracts International, 33A:4663-4664; March 1973.

Clough, Roger Anthony. An Analysis of Student Achievement in Mathematics When Individually Prescribed Instruction (IPI) is Compared to the Current Instructional Program. (University of Nebraska, 1971.) Dissertation Abstracts International, 32A:2949; October 1971.

Cohen, Louis Sayles. An Investigation of the Effectiveness of Certain Scheduling Procedures on Mathematical Achievement of Junior High School Pupils. (University of Minnesota, 1970.) Dissertation Abstracts International, 31A:1995; November 1970.

Concannon, Sister J. An Experimental Study of the Influence of Individual vs. Group Instruction on Selected Affective Behaviors. Cooperative Research Report No. 2065. Chestnut Hill, Massachusetts: Boston College School of Education, 1966. (ERIC: ED 010 126; 166p.)

Corbin, Harold Glen. An Individualized Approach: An Evaluation of Cognitive and Affective Learning in Seventh and Eighth Grade Mathematics Classes. (University of Southern California, 1974.) Dissertation Abstracts International, 34A: 6237; May 1974.

Crandle, Eva Abbie. An Evaluative Study of the Northwest Junior High School Individualized Mathematics Program. (University of Utah, 1971.) Dissertation Abstracts International, 32A:1774-1775; October 1971.

Crosby, Gwladys; Fremont, Herbert; and Witmer, Harold E. Mathematics Individual Learning Experiment. 1960. (ERIC: ED 003 558; 114p.)

Dahlke, Richard M. A Case Study of an Individualized Course in Arithmetic at a Community College. (University of Michigan, 1971.) Dissertation Abstracts International, 32A:6287; May 1972.

Dahlke, Richard M. "Determining the Best Predictors of Success and of Time of Completion or Dropout in an Individualized Course in Arithmetic at a Community College. Journal for Research in Mathematics Education, 5: 213-222; November 1974.

Deep, Donald. The Effect of an Individually Prescribed Instruction Program in Arithmetic on Pupils at Different Ability Levels. (University of Pittsburgh, 1966.) Dissertation Abstracts, 27A:2210-2211; February 1967.

DeRenzis, Joseph John. An Investigation into the Attitude Patterns and Their Relationship to Prescription Writing Procedures of Teachers Using the IPI Instructional System in Elementary Mathematics. (Temple University, 1970.) Dissertation Abstracts International, 31A:6098; June 1971.

Drake, Richard M. "A Comparison of Two Methods of Teaching High School Algebra." Journal of Educational Research, 29: 12-16; September 1935.

Dutton, Wilbur H. "Individualizing Instruction in Elementary School Mathematics for Prospective Teachers." Arithmetic Teacher, 13:227-231; March 1966.

Ebeid, William Twadros. An Experimental Study of Scheduled Classroom Use of Student Self-selected Materials in Teaching Junior High School Mathematics." (University of Michigan, 1963.) Dissertation Abstracts, 25:3427-3428; December 1964.

Englert, Thomas James. A Comparative Study of the Effects on Achievement and Changes in Attitude of Junior High School Students Enrolled in First Year Algebra Under Two Different Teaching Approaches. (Cornell University, 1972.) Dissertation Abstracts International, 33A:1076-1077; September 1972.

Mallon, Robert Ambrose. The Contingency Contracting Learning System: Its Effect Upon Elementary School Mathematics Achievement, Personal and Social Adjustment, and Attitude Toward School. (University of Minnesota, 1973.) Dissertation Abstracts International, 34A:2268-2269; November 1973.

Pennell, Francis Michael. The Effect of Diagnostic Mathematics Instruction on the Achievement and Attitude of Low Achieving Sixth Grade Pupils. (Pennsylvania State University, 1972.) Dissertation Abstracts International, 33A:3378; January 1973.

[illegible], Patricia Peyser. A Presentation and Evaluation of an Individualized Instruction Course in First Year Algebra. (University of Utah, 1972.) Dissertation Abstracts International, 33A:1187; September 1972.

Perney, Gary Axel. An Evaluation of a Program for Learning in Accordance with Needs. (Washington State University, 1969.) Dissertation Abstracts International, 30A:4327; April 1970.

Fielder, Robert Earl. The Comparative Effect of Two Years of Individually Prescribed Instruction on Student Achievement in Mathematics. (East Texas State University, 1971.) Dissertation Abstracts International, 32A:5103; March 1972.

Fisher, Jack B. An Investigation of Three Approaches to the Teaching of Mathematics in the Elementary School. (University of Pittsburgh, 1967.) Dissertation Abstracts, 28A:4947-4949; June 1968.

Fisher, Victor Lee, Jr. The Relative Merits of Selected Aspects of Individualized Instruction in an Elementary School Mathematics Program. (Indiana University, 1966.) Dissertation Abstracts, 27:3966; April 1967.

Fitzgerald, William M. Self-Selected Mathematics Learning Activities. Michigan University, 1965. (ERIC: ED 003 348; 105p.)

Flournoy, Lorella Pauline. Individualized Instruction in Mathematics for First-Grade Children. Dissertation Abstracts International, 34A:5582; March 1974.

Frase, Larry Eugene. A Comparison of Two Individualized Mathematics Programs on Student Independence, Achievement, Time, and Attitude Criterion Measures. (Arizona State University, 1971.) Dissertation Abstracts International, 32A: 1978; October 1971.

Fremont, Herbert I. Individualized Instruction in Plane Geometry: A Comparison of the Relative Effectiveness of Learning Plane Geometry by an Individualized Approach as Contrasted with the Traditional Approach of Group Instruction. (New York University, 1963.) Dissertation Abstracts, 24:3227-3228; February 1964.

Gadske, Richard Edward. "A Comparison of Two Methods of Teaching First Year High School Algebra." School Science and Mathematics, 33: 635-640; June 1933.

Gaskill, Edgar Allen. An Evaluation of Individually Prescribed Instruction in the Primary Grades of the Urbana Schools. (Illinois State University, 1970.) Dissertation Abstracts International, 31A:4416; March 1971.

Gibb, Doris and Infoch, Ann. Individualizing Mathematics in the Small School. Colorado State Department of Education, Denver, Colorado, 1964. (ERIC: ED 036 365; 30p.)

Glaser, Robert. The Program for Individually Prescribed Instruction. Pennsylvania: Learning Research and Development Center, University of Pittsburgh, 1966. (ERIC: ED 010 519; 17p.)

Glavach, Mathew and Stoner, Donovan. "Teaching the Unteachables." California Journal of Educational Research, 21: 111-119; May 1970.

Golde, John Arthur. A Comparison of Young Children in Achievement of General Skills, Adjustment, and Attitudes in an Individual Progression Curriculum Organization with Young Children in a Traditional Curriculum Organization. (Northern Illinois University, 1972.) Dissertation Abstracts International, 34A:2164; November 1973.

Graeber, Anna Clea. Diagnostic-Test-Based Prescriptions in Individually Prescribed Instruction in Mathematics. (Columbia University, 1974.) Dissertation Abstracts International, 35A:2646-2647; November 1974.

Graham, William A. "Individualized Teaching of Fifth- and Sixth-Grade Arithmetic." Arithmetic Teacher, 11: 233-234; April 1964.

Grant, Jettye Fern. A Longitudinal Program of Individualized Instruction in Graded 4, 5, and 6. (University of California at Berkeley, 1964.) Dissertation Abstracts, 25:2882-2883; November 1964.

Greathouse, Jimmie Joe. "An Experimental Investigation of Relative Effectiveness Among Three Different Arithmetic Teaching Methods." (University of New Mexico, 1965.) Dissertation Abstracts, 26:5913; April 1966.

Gryde, Stanley Hermit. A Paradigm for the Application of the Audio-Tutorial System in Construction to the Secondary School. (University of Southern California, 1971.) Dissertation Abstracts International, 32A:3136; December 1971.

Guiler, W.S. and Edwards, Vernon. "An Experimental Study of Methods of Instruction in Computational Arithmetic." Elementary School Journal, 43: 353-360; February 1943.

Hamby, Kelly Dean. A Model for Modifying Individualized Instruction. (University of Texas at Austin, 1971.) Dissertation Abstracts International, 33A:142; July 1972.

Hamilton, Dwight. "An Experiment With an Individual Technique in Sixth Grade Arithmetic." Journal of Educational Research, 18: 339-344; November 1928.

Hanneman, James Howard. An Experimental Comparison of Independent Study and Conventional Group Instruction in Tenth Grade Geometry. (University of Florida, 1971.) Dissertation Abstracts International, 32A:6289; May 1972.

Harper, Kenneth John. A Comparison of Three Elementary Mathematics Programs: A Model for Curriculum Evaluation. (Wayne State University, 1972.) Dissertation Abstracts International, 33A:6659-6660; May 1973.

Holman, Marcia Bernice. Individualized Instruction in the Classroom. (University of Michigan, 1970.) Dissertation Abstracts International, 31A:3956; February 1971.

Helms, David Clarke, Jr. Use of a Formative Evaluation Technique in Determining the Differential-Achievement Effects of the IPI Mathematics, 1967-1970. Dissertation Abstracts International, 34A:4698-4699; February 1974.

Hirsch, Christian Richard, Jr. An Experimental Study Comparing the Effects of Guided Discovery and Individualized Instruction on Initial Learning, Transfer, and Retention of Mathematical Concepts and Generalizations. (University of Iowa, 1972.) Dissertation Abstracts International, 33A:3194-3195; January 1973.

Holste, Donald Ernest. The Effect of Different Prescriptions Used by Teachers in an IPI Mathematics Program. (University of Illinois at Urbana-Champaign, 1972.) Dissertation Abstracts International, 33A:552; August 1972.

Johnson, Larry. Minneapolis IPI Mathematics Project 1971-1972: Third Year Evaluation. A Title I ESEA Project. Minneapolis Public Schools, Minneapolis Department of Research and Evaluation. (ERIC: ED 083 290; 61p.)

Jones, Daisey M. "An Experiment in Adaptation to Individual Differences." Journal of Educational Psychology, 39: 257-272; May 1948.

Joyner, Virginia Green. The Development and Evaluation of a Routine Using a Diagnostic Pretest, Individualized Assignments and Dienes Blocks for the Instruction of Elementary Education Majors in CUPA Level-1 Mathematics. (The Florida State University, 1972.) Dissertation Abstracts International, 34A:6500; April 1974.

Kellett, Jeremiah J. Bridging the Grade Six to Seven Gap With Continuous Progress. Western Junior High School, Massachusetts, 1966. (ERIC: ED 010 109; 33p.)

Kissel, Mary Ann. A Comparative Investigation of the Efficiency of Two Classroom Observational Methods. (University of Pittsburgh, 1970.) Dissertation Abstracts International, 31A:4385-4386; March 1971.

Kocher, Manfred and Dreyfuss, Gail. "An Experiment in Teaching College Mathematics." International Journal of Mathematical Education in Science and Technology, 3: 315-328, October-December 1972.

Montagiance, John T. The Effects on Achievement, Retention, and Attitude of an Individualized Instructional Program in Mathematics for Prospective Elementary School Teachers. Dissertation Abstracts International, 34A:5802; March 1974.

Mriewall, Thomas Edward. Applications of Information Theory and Acceptance Sampling Principles to the Management of Mathematics Instruction. (University of Wisconsin, 1969.) Dissertation Abstracts International, 30A:5344; June 1970.

LaPlace, Nicholas Anthony. A Cost-Effectiveness Analysis of Individual Learning Units in a Junior High School Basic Mathematics Program. Dissertation Abstracts International, 34A:3771-3772; January 1974.

Liguori, Ralph Anthony. A Controlled Study of P.S.I. Procedures Applied to a College Business Mathematics Course. (University of New Mexico, 1973.) Dissertation Abstracts International, 35A:1591-1592; September 1974.

Lindvall, C.M. and Weaver, J.B. An Exploratory Investigation of Selected Dynamics of Grade 6 Teaching. Learning Research and Development Center, University of Pittsburgh, 1969. (ERIC: ED 040 520; 13p.)

Lipson, Joseph. Transfer and Generalization in Individually Prescribed Instruction. Learning Research and Development Center. University of Pittsburgh, February 1966. (ERIC: ED 010 521; 29p.)

Lowerre, George Fitzgerald. Conceptually Based Development of Individualized Materials for Critical Thinking Based on Logical Inference. (University of Pennsylvania, 1972.) Dissertation Abstracts International, 33A:1418; October 1972.

Malcom, Paul Joseph. Analysis of Attitude, Achievement, and Student Profiles as a Result of Individualized Instruction in Mathematics. (University of Nebraska, 1972.) Dissertation Abstracts International, 33A:3261-3262; January 1973.

Mayer-Oakes, C.N. "The Dalton Plan in a Small High School." Education, 57: 244-248; December 1936.

McDermott, Cecil W. The Development of an Individualized Learning System for Students Studying Intermediate Algebra, Final Report. Hendrix College; Conway, Arkansas, July 1972. (ERIC: ED 077 774; 42p.)

McHugh, Walter J. Team Learning in Skills Subjects in Intermediate Grades. Journal of Education, 142: 22-51; December 1959.

Meade, William P. and Griffin, Lawrence M. "A Comparative Study of Student Achievement and Other Selected Student Characteristics in a Program of Individualized Instruction in Mathematics and in a Program of Traditional Instruction in Mathematics in Grades 1-6." Investigations in Mathematics Education, 5: 23-26; (ERIC: ED 063 161; p.31-34.)

Meade, William P. and Griffin, Lawrence M. A Comparative Study of Student Achievement and Other Selected Student Characteristics in a Program of Individualized Instruction in Mathematics and in a Program of Traditional Instruction in Mathematics in Grades 1-6. (ERIC: ED 057 362; 156p.)

Miller, Wayne Lee, Jr. A Study of the Relations Between Contract/Traditional Teaching Methods and Attitude/Achievement in Community College Mathematics Instruction. (University of Houston, 1974.) Dissertation Abstracts International, 35A:4053; January 1975.

Moench, Laurel. "Individualized Practice in Arithmetic- A Pilot Study." Arithmetic Teacher, 9: 361-362; October 1962.

Monrief, Michael Howard. A Validation Study of Selected Decision Rules Used in the Assignment of Student Programs through an Individualized Mathematics System. (Florida State University, 1972.) Dissertation Abstracts International, 33A: 4047; February 1973.

Morningstar, Neal. The Aspen Continuous Progress Plan. Denver: Colorado State Department of Education, 1972. (ERIC: ED 071 788; 33p.)

Morris, J. Claire. A Descriptive Analysis and Evaluation of an Integrated Program of Individualized Instruction in Cedar City High School. (Brigham Young University, 1969.) Dissertation Abstracts, 30A:2037; March 1969.

Morrison, Maria P. "Ware Method in Teaching Multiplication to Fourth Grade Pupils." Education, 57:345-347; February 1937.

Nabors, Cecil Thomas. The Effect of Individualized Verbal Problem Assignments on the Mathematical Achievement of Fifth-Grade Students. (University of Houston, 1969.) Dissertation Abstracts, 29:1169; October 1968.

Penney, Donald Lee. The Effects of Individualized and Traditional Mathematics Instruction Programs on Achievement and Self-Concept Scores. Dissertation Abstracts International, 35A:174,175; July 1974.

Neufeld, N. Allen. Differences in Personality Characteristics Between Groups Having High and Low Mathematics Achievement Gains Under Individualized Instruction. (University of Wisconsin, 1967.) Dissertation Abstracts, 28:4540; May 1968.

Neujahr, James Lloyd. An Analysis of Teacher-Pupil Interactions When Instruction is Individualized. (Columbia University, 1970.) Dissertation Abstracts International, 31A:4041; February 1971.

New Mexico Western States Small Schools Project. Programmed Mathematics, Dora High School. Santa Fe, New Mexico, November 1969. (ERIC: ED 026 184; 7p.)

Newman, Frederick L. et.al. "Initial Attitude Differences Among Successful, Procrastinating, and 'Withdrawn-From-Course' Students in a Personalized System of Statistics Instruction." Journal for Research in Mathematics Education, 5: 105-113; March 1974.

Nix, George Carol. An Experimental Study of Individualized Instruction in General Mathematics. (Auburn University, 1969.) Dissertation Abstracts International, 30A: 3367-3368; February 1970.

Oles, Henry John. Factors Associated With Self-Scoring Behavior in Students Using Individually Prescribed Instruction. (University of Pittsburgh, 1971.) Dissertation Abstracts International, 32A:3796; January 1972.

Olsen, James Clarence. A Comparison of Two Methods of Teaching a Remedial Mathematics Course at the Community College. Dissertation Abstracts International, 34A:7522-7523; June 1974.

O'Neill, Jane Anne. "Analysis on Selected Variables of the Effect of a Systems Approach to Teaching Specific Math Skills to Fifth Grade Students from a Disadvantaged Area." (The University of Connecticut, 1970.) Dissertation Abstracts International, 31A:6286; June 1971.

Penner, Herbert Duayne. An Analysis of Using an Individual Progress Approach to the Teaching of Trigonometry in the Omaha, Nebraska, Public High Schools. (University of Nebraska, 1972.) Dissertation Abstracts International, 33A:1421; October 1972.

Phillips, Charles Arthur. A Study of the Effect of Computer Assistance Upon the Achievement of Students Utilizing a Curriculum Based on Individually Prescribed Instruction Mathematics. Dissertation Abstracts International, 34A:3719; January 1974.

Pigge, Fred L.; and others. Final Evaluation Report, Secondary Middle School Mathematics. Bowling Green State University, Ohio, August 1972. (ERIC: ED 077 747; 269p.)

Doni, Thomas Francis Jr. Individualized Instruction: A Model for Teacher Preparation. (University of North Dakota, 1973.) Dissertation Abstracts International, 34A: 3220; December 1973.

Futhrose, Larry Max. An Investigation Into the Effect of Selected Patterns of Grouping Upon Arithmetic Achievement. (University of South Dakota, 1971.) Dissertation Abstracts International, 32A:5113; March 1972.

Hedbird, Helen. Individualizing Arithmetic Instruction. Arithmetic Teacher, 11: 348-349; May 1964.

Regula, Charles Richard. A Study of the Relative Importance of Selected Pre-skills and the Effects of Group and Individual Instruction in the Use of the DOT Overlay Technique in Teaching Addition to the Educable Mentally Retarded. (University of Oregon, 1972.) Dissertation Abstracts International, 33A:6757; June 1973.

Resner, Jerome. Changes in First-Grade Achievement and the Predictive Validity of I.Q. Scores, as a Function of an Adaptive Instructional Environment. Pittsburgh University, Pennsylvania, Learning Research and Development Center, 1972. (ERIC: ED 079 953; 17p.)

Salzberg, Charles L. The Effect of a Free Time Contingency on the Rate of Math Progress in an Elementary 'Free' School. (University of Kansas, 1972.) Dissertation Abstracts International, 33B:5550; May 1973.

Scanlon, Robert G. Factors Associated With a Program for Encouraging Self-Initiated Activities by Fifth and Sixth Grade Students in a Selected Elementary School Emphasizing Individualized Instruction. (University of Pittsburgh, 1966.) Dissertation Abstracts, 27A:3276; April 1967.

Scanlon, Robert G. Factors Associated With a Program for Encouraging Self-Initiated Activities by Fifth and Sixth Grade Students in a Selected Elementary School Emphasizing Individualized Instruction. (ERIC: ED 015 785; 99p.)

Schaefer, William Albert. The Relationship of Teaching Methods to Self-Esteem and Achievement in Mathematics Among Seventh and Eighth Grade Students. (Northern Illinois University, 1972.) Dissertation Abstracts International, 33A:624; August 1972.

Schoen, Harold L. "A Plan to Combine Individualized Instruction With the Lecture Method." Mathematics Teacher, 67:647-651; November 1974.

Schultz, Margaret and Ohlsen, M.M. "A Comparison of Traditional and Personalized Teaching in Ninth Grade Algebra." Mathematics Teacher, 42: 91-96; February 1949.

Shumaker, James E. A Comparison of Study Habits, Study Attitudes, and Academic Achievement in Mathematics in Junior High School of Students Taught by Individually Prescribed Instruction and Students Taught by Traditional Methods of Instruction in Elementary School. (University of Pittsburgh, 1972.) Dissertation Abstracts International, 33A:6657; June 1973.

Spurgeon, Frank. "An Experiment in Individualized Mathematics." The Instructor, 69: 58; 68; February 1960.

Singh, Jane Marie. An Investigation of the Effect of Individualized Enrichment Homework Upon the Academic Achievement of Children in the Fourth, Fifth, and Sixth Grades. (Arizona State University, 1969.) Dissertation Abstracts International, 30A:3203-3204; February 1970.

Sinks, Thomas A. "How Individualized Instruction in Junior High School Science, Mathematics, Language Arts, and Social Studies Affects Student Achievement. (University of Illinois, 1968.) Dissertation Abstracts International, 30:224-225; July 1969.

Smith, Gerald Eugene. The Relationship of Cognitive Style and Instructional Treatment in the Acquisition of Strategies for Teaching Elementary Mathematics. (University of Texas at Austin, 1972.) Dissertation Abstracts International, 33A:3470; January 1973.

Snyder, Henry Duane Jr. A Comparative Study of Two Self-Selection-Pacing Approaches to Individualizing Instruction in Junior High School Mathematics. (University of Michigan, 1966.) Dissertation Abstracts, 28:159-160; July 1967.

Spraker, Harold Stephen. A Study of the Comparative Emergence of Creative Intellectual Behavior During the Process of Group and Individual Study of Mathematics. (University of Virginia, 1960.) Dissertation Abstracts, 21:2199-2200; February 1961.

Suppes, Patrick. "Modern Learning Theory and the Elementary School Curriculum." American Educational Research Journal, March 1964, pp. 79-94.

Sutton, Joseph T. Individualizing Junior High School Mathematics Instruction. Final Report. August 1967. (ERIC: ED 016 609; 62p.)

Taylor, Derek N. and Fleming, Margaret. Individually Prescribed Instruction Program (Mathematics), Disadvantaged Pupil Program Funds, Fund Number 62-10, 1971-72, Evaluation. Cleveland Public Schools, Ohio. Division of Research and Development, December 1972. (ERIC: ED 077 700; 69p.)

Taylor, Loretta Kay. Independent Study Versus Presentation by Lecture and Discussion: A Comparative Study of Attitude and Achievement in Two Algebra I Classes. (University of Northern Colorado, 1971.) Dissertation Abstracts International, 32A:3977; January 1972.

Thomas, Dennis Brown. An Evaluation of Individually Prescribed Instruction (IPI) Mathematics in Grades Five and Six of the Urbana Schools. (Illinois State University, 1972.) Dissertation Abstracts International, 33A:1335; October 1972.

Thomas, Buron C. Continuous Progress Advanced Algebra in the Lincoln Public Schools-A Study of Achievement and Attitude Toward Mathematics. (University of Nebraska, 1971.) Dissertation Abstracts International, 33A:6113-6114; May 1972.

Thompson, A.P. "Diagnosis and Remedial Instruction in Mathematics." School Science and Mathematics, 41:125-128; February 1941.

Thompson, William Worthen. "An Experiment With the Dalton Plan." Journal of Educational Research, 26: 499-500; March 1933.

Tilton, J.W. "Individualized and Remedial Instruction in Arithmetic." Journal of Educational Research, 38: 93-98; February 1947.

Tychsen, Alfred Belmer. An Experimental Comparison of Teacher-Paced Instruction and Student-Paced Instruction in the Teaching of Mathematics in the Public Elementary Schools in Greenwich, Connecticut. (University of Connecticut, 1971.) Dissertation Abstracts International, 32A:2382-2383; November 1971.

Verheul, Gustav Wilhelm. A Comparison of the Effects of Individually Prescribed Instruction and Conventional Textbook Instruction on Mathematics Learning of Selected Sixth Grade Students. (The Florida State University, 1971.) Dissertation Abstracts International, 32A:4853-4854; March 1972.

Wasden, Francis Del Mar. A Comparative Analysis of the Difference in Achievement Between Students Educated in Traditional and Individualized Schools. (Brigham Young University, 1971.) Dissertation Abstracts International, 32A:1247; September 1971.

Weinberger, J. Ann. Temporal Retention Study on IPI Mathematics. Philadelphia: Research for Better Schools, Inc., 1969. (ERIC: ED 036 181; 10p.)

Wheaton, Wilbur Dean. An Evaluation of an Individualized Learning Program in a California Union High School District. (University of Southern California, 1971.) Dissertation Abstracts International, 32A:5540-5541; April 1972.

Whipple, Robert W. A Statistical Comparison of the Effectiveness of Teaching Metric Geometry by the Laboratory and Individualized Instruction Approaches. (Northwestern University, 1972.) Dissertation Abstracts International, 33A: 2699-2700; December 1972.

Williams, Benjamin George. An Evaluation of a Continuous Progress Plan in Reading and Mathematics on the Achievement and Attitude of Fourth-Grade, Fifth-Grade, and Sixth-Grade Pupils. Dissertation Abstracts International, 34A:7115-7116; May 1974.

Williams, Herbert B. "An Experiment in Self-Directed Education." School and Society, 31: 715-718; May 24, 1930.

Wolff, Bernard Ryan. An Analysis and Comparison of Individualized Instructional Practices in Arithmetic in Graded and Nongraded Elementary Classrooms in Selected Oregon School Districts. (University of Oregon, 1969.) Dissertation Abstracts, 29A:4397; June 1969.

Wood, Stillman Wayne. A Study of Selected Student, Instructional, and Achievement Variables Within a Program of Individually Prescribed Instruction in Mathematics for Junior High Educable Retardates. (University of Oregon, 1972.) Dissertation Abstracts International, 33A:6760-6761; June 1973.

Zahorik, John A. "Individual Instruction and Group Instruction: A Case Study." Journal of Educational Research, 62: 453-455; July/August 1969.

References

Arena, John E. "An Instrument for Individualizing Instruction." Educational Leadership, 27:784-787; May 1970.

Baker, Gail L. and Goldberg, Isadore. "The Individualized Learning System." Educational Leadership, 27:775-780; May 1970.

Bittinger, Marvin L. "A Comparison of Approaches for Teaching Remedial Courses at the College Level." Mathematics Teacher, 65:455-458; May 1972.

Canadian Teachers' Federation. Individualized Instruction, Bibliographies in Education, No. 12. Ottawa (Ontario), November 1970. (ERIC: ED 046 881; 49p.)

Dahlke, Richard K. "Studying the Individual in an Individualized Course in Arithmetic at a Community College: A Report on Four Case Studies." Mathematics Teacher, 68:181-188; March 1975.

Flewelling, Wilma Shaffer. "A Critical Evaluation of Individualized Instruction in Mathematics." Mathematics Teacher, 20:280-285; May 1927.

Fleming, Theresa. "Meeting Individual Differences in Arithmetic." Arithmetic Teacher, 7:80-86; February 1960.

Gibb, Glenadine E. "Through the Years: Individualizing Instruction in Mathematics." Arithmetic Teacher, 17:396-401; May 1970.

Grobman, Hulda. "Educational Packages- Panacea?" Educational Leadership, 27:781-783; May 1970.

Indelicato, Arthur. "Individualizing Mathematics in a Modular-Scheduling Program." Mathematics Teacher, 65:394, 459-462; May 1972.

Institute for Development of Educational Activities. Individualizing Instruction: A Selected Bibliography. The I/D/E/A Bibliography Series. Dayton, Ohio, 1969. (ERIC: ED 030 619; 23p.)

Jatlonsky, Adelaide. A Selected ERIC Bibliography on Individualizing Instruction. ERIC-IRCD Urban Disadvantaged Series, Number 2, January 1969. New York: Columbia University, 1969. (ERIC: ED 027 359; 36p.)

Jerman, Max. "The Use of Computers to Individualize Instruction." Mathematics Teacher, 65:395, 466-471; May 1972.

Lindvall, C.M. and Bolvin, John. The Project for Individually Prescribed Instruction, The Oakleaf Project. Learning Research and Development Center, University of Pittsburgh, 1966. (ERIC: ED 010 522; 19p.)

Lipson, Joseph. Individualization of Instruction in Junior High School Mathematics. November 6, 1970. (ERIC: ED 046 742; 29p.)

Lipson, Joseph T. and others. The Development of an Elementary School Mathematics Curriculum for Individualized Instruction. Learning Research and Development Center, University of Pittsburgh, 1970. (ERIC: ED 043 120; 20p.)

MacPherson, Eric D. "How Much Individualization?" Mathematics Teacher, 65:395, 475-479; May 1972.

Mochy, Claire A. Teaching in IPI Mathematics. Volumes I-VI. Philadelphia: Research for Better Schools, Inc., 1969. (ERIC: ED 030 584; 869p.)

Osmundson, Arnold. "Individualized Mathematics Instruction Through a System of Continuous Progress." Mathematics Teacher, 65:417-420; May 1972.

Potanin, Caroline C. "An Experiment in Individualized Arithmetic." Elementary School Journal, 64:155-162; December 1963.

Reed, Jack A. "Individualized Instruction -A Positive Experience?" School Science and Mathematics, 74:366-370; May-June 1974.

Research for Better Schools, Inc. A Progress Report: Individually Prescribed Instruction. Philadelphia, Pennsylvania; August 1969. (ERIC: ED 036 147; 63p.)

Searight, Franklyn. "You Can Individualize Arithmetic Instruction." Arithmetic Teacher, 11:199-200; March 1964.

Spaulding, Robert L. "Personalized Education in Southside School." Elementary School Journal, 70:180-189; January 1970.

Suydam, Marilyn N. Interpretive Study of Research and Development in Elementary School Mathematics. Volume 2: Developmental Projects. Pennsylvania State University, June 30, 1969. (ERIC: ED 030 018; 232p.)

Wale, Serena T. Individualized Instruction: An Annotated Bibliography. Stanford University, 1968. (ERIC: ED 029 512; 22p.)

Whitaker, Walter L. "Individualized Arithmetic -An Idea to Improve the Traditional Arithmetic Program." Arithmetic Teacher, 9:134-37; March 1962.

White, Virginia T. "A Profile of Individualized Instruction." Mathematics Teacher, 65:394, 448-453; May 1972.

Willcutt, Robert E. "Individual Differences -Does Research Have Any Answers for Junior High Mathematics Teachers?" School Science and Mathematics, 69:217-225; March 1969.

Zamboni, Floyd F. "Ways of Varying Classroom Procedures." Mathematics Teacher, 65: 421-422; May 1972.

APPENDIX

TABLES

Table 1: Research Summary Chart for Individualized Instruction..... 47

Table 2: Grade Level Distribution Chart for Individualized Mathematics Instruction..... 72

Table 3: Distribution by Year Chart for the Individualized Mathematics Instruction Studies..... 74

Table 4: Individually Prescribed Instruction (IPI) Studies..... 75

Table 5: Time Length of Studies Compared with Achievement..... 76

Table 6: Studies That Considered Ability Levels..... 77

Table 7: Sex Differences..... 79

Table 8: Summary Chart of the Negative Studies on Individualized Instruction. 80

Table 9: Summary Chart on the Positive Studies on Individualized Instruction. 81

Table 1

Research Summary Chart for Individualized Instruction

The numerical scores found in the following table are defined as follows:

4 - Significant results in favor of experimental (individualized instruction) group.
3 - Mixed results: some significant, some not significant in favor of individualized instruction.
2 - No significant results for either individualized instruction or control groups.
1 - Mixed results: some significant, some not significant in favor of control group.
0 - Significant results in favor of control group.

A dash in a column indicates that the factor in question was not considered in the study. Comments may appear in the achievement or attitude rating columns where numerical scores could not be assigned.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Abate 1972	1, 2, 3, 4	447	2	2	Studied an individualized educational system called PLAN (Program of Learning in Accordance with Needs.) Grade 4 PLAN students did not do as well as the control group, while in grades 1, 2, and 3, the students did just as well.
Acquaviva 1973	Senior High	260 High Schools	-	-	A survey to determine the extent of ability grouping and individualized instruction programs in the public high schools of New Jersey. 82.7% of the schools ability grouped and one-fifth of the schools reported programs of individualized instruction involving 7.5% of the enrolled students.
Alschuler 1969	5	13-Control 15-Experimental 28-Total	4	Experimental class liked math considerably more than in the previous year.	Used a math Contract system.
Amendola 1973	1, 3, 4, 5, 6, 7, 8	560	1	2	A continuous progress program was not as effective in improving computational skills. There was no difference for arithmetic concepts.
Arrants 1972	Primary	45	Mean gain scores on an arithmetic comprehension test were significantly higher.	-	No control group; sample subjects were primary educable mentally retarded children. The program used was Individually Prescribed Instruction (IPI) with behavioral objectives.
Bailek and Castro 1969	Elementary	4-IPI Schools 4-Conventional Schools	1	4	Second year evaluation of IPI.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Baley and Benesch 1969	General Math (Sr. High)	45-Control 45-Experimental 90-Total	4	-	Emphasis was on improvement of computational skills.
Ball 1973	General Math (9th Grade)	2-Control Classes 2-Experimental Classes	2	2	Student Contracting.
Banghart and Spraker 1963	7	87-Group Treatment 93-Individual Treatment 180-Total	-	-	Major purpose of study was to investigate the role of group influence on creativity during mathematical problem solving. Classes were separated into two high classes, four average classes, and two low classes. No significant difference was found between group and individual problem solvers in terms of creativity. Significant differences did exist between levels of intelligence. A correlation of .59 was found between creativity and intelligence and .66 between creativity and achievement.
Bartel 1965	4	1-Control Class 2-Experimental Classes	3	-	Results were measured by a standardized arithmetic achievement test and a concept test. Significant results were found on the concept test.
Bazik 1972	Prospective Elementary Teachers	14-Control 21-Experimental 35-Total	2	-	The null hypothesis was nearly rejected ($p < .106$). No significant difference was found for retention.
Beamer 1970	5	96	-	-	This study was concerned with transfer improvement after students were taught individually and in pairs to multiply fractions. The only effect found to be significant was intelligence.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Bernstein 1956	9, General Math	48-Control 55-Experimental 103-Total	4	-	Used small group and individualized instruction to improve diagnosed deficiences in computational skills. A clinic approach was used where students spent an average of 4½ weeks in the math clinic and then went back to regular class.
Beul 1973	7	199-Control 202-Experimental 401-Total	4	0	A one semester study involving five units of instruction. Experimental group showed a significant decrease in attitude while the control group showed no significant change.
Bierden, 1968	7	4-Control Classes 2-Experimental Classes	2	4	Used detailed behavioral objectives and flexible intraclass grouping to provide for individual differences.
Bolvin 1966	Elementary	1 School (Oakleaf Elementary)	-	-	Discusses and gives supporting data for the hypothesis that variability of achievement within a particular grade approximates the number of years the pupils have been in school.
Bowen 1974	7	60	2	2	An individualized team program that offered a variety of methods to study mathematics including student choice of teacher, type of study, time for taking tests, independent study, and self-pacing.
Bradley 1967	5	101-Control 101-Experimental 202-Total	-	-	Study compared individualized versus blanket-type homework assignments. Individualized method was significantly better.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Bradford 1972	Elementary	1-Control School 1-Experimental School	4	The attitudes of students in the experimental school were positive in some aspects of the program.	Experimental school used the Individually Guided Education Program. Self-concept scores were significantly greater in favor of of the experimental group.
Brender 1973	Middle School	Not Given	Much evidence was supportive of the program	-	No control group; the program taught was an individualized unit on fractions incorporating diagnostic teaching and a mathematics laboratory.
Broussard 1971	4	495	4	-	Study involved inner-city students in Stockton, California.
Broussard 1969	Junior High	2-Control Classes 2- Experimental Classes	4	-	Program invited many parents and businessmen to participate. A multimedia approach was used to improve math skills of underachievers.
Brust 1972	5	56-Control 56-Experimental 112-Total	2	-	The program was project PLAN (Program of Learning in Accordance with Needs.) Also tested language art skills and self-esteem. On eight comparisons, all were not significant except for arithmetic computation which was significant in favor of the control group.
Bull 1971	High School Geometry	2-Control Classes 2-Experimental Classes	4	-	Also found that students taught geometry during the 7th period of the day did significantly better than students in 1st period.
Chatterley 1972	7	96	-	-	The study compared four self-instructional modes of individualized instruction. Multimedia materials with correct answer feedback was the most effective. Low and median ability groups especially benefited by this mode.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Clough 1971	1, 2, 3	507	3	-	Compared IPI program with a traditional program. Significant gains were made for male students, first grade students, and high IQ students.
Cohen 1970	7	443	2	2	The study compared modular curricular plan vs individualized instruction plan vs traditional. Sampling procedure was a major limitation in the study.
Concannon 1966	Preschool Ages 3 to 5	144 Students in 4 Schools	2	-	The topic taught was geometry (spatial ability). No significant differences were found for type of instruction (individual vs group). But significant differences were found in favor of the Montessori curriculum over the non-Montessori.
Corbin	7, 8	100-Control 104-Experimental 204-Total	2	2	-
Crangle 1971	8	31-Control 31-Experimental 62-Total	0	-	No significant differences were found in work study skills.
Crosby 1960	9, Elementary Algebra	36 Classes	2	2	There was a significant drop in the mean scores of both groups in attitude.
Dahlke 1971	Community College	113	63% of students were successful	-	The study was concerned with determining the best predictors of success and time of completion or dropout in an individualized course in arithmetic. The students' precourse computation test score and stated reasons as to why they enrolled were the best predictors of success.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Deep 1966	4, 5, 6	4 Schools	-	-	The effect of the IPI program on three different ability levels was considered. There was no significant difference between the three groups among the Oakleaf Elementary School students. However, some differences were found in two conventional schools
DeRenzis 1970	Teachers	208	-	-	Analyzed the relationship between the prescriptions teachers write in IPI mathematics and the attitudes of these same teachers.
Drake 1935	9, Algebra	22-Control 22-Experimental 44-Total	0	-	Mean IQ for this experiment was high: 118.7 for the group method and 120.3 for the individual.
Dutton 1966	Prospective Teachers	80	Program was effective	-	No control group.
Ebeid 1964	7, 8	163-Control 94-Experimental 257-Total	2	2	The program provided self-selected activities one period a week in the 1st semester and two periods a week in the 2nd semester.
Eilberg 1931	Geometry	30-Control 30-Experimental 60-Total	3	-	This study is described in the review by Douglass (1936) and compares the Dalton Plan with the conventional method.
Englert 1972	Algebra I	3-Control Classes 3-Experimental Classes	2	2	Students in the experimental group studied on their own, studied with another student, were taught individually by the teacher or listened to tapes.
Fallon 1973	Elementary	Not Given	3	2	Experimental group used the contingency contracting learning system. Significant results were found for math concepts, while no significant results were found for computation, problem-solving, personal adjustment, social adjustment, and attitude toward school.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Fennell 1972	6, Low Achievers	5-Control Classes 5-Experimental Classes	2	2	Ten undergraduate elementary education students who had never taught previously volunteered to teach the classes in this study.
Fernandez 1972	Algebra I	Not Given	Compared favorably with national norms.	More positive than students in a nearby traditional school.	No control group; material for the Algebra I course was evaluated as it was used for a year at an experimental, individualized instruction school.
Ferney 1969	5	175-Control 196-Experimental 371-Total	0	2	Experimental students participated in project PLAN. Girls using PLAN achieved higher scores than did boys.
Fielder 1971	3, 4 in 1968 5, 6 in 1970	Not Given	0	-	Experimental group used the IPI program and consisted of students in a pilot school for a two-year period.
Fisher, J. 1967	3, 4, 5	Not Given	2	-	The groups that were compared were IPI vs programmed learning vs standard classroom instruction.
Fisher, V. 1966	6	1-Control Class 2-Experimental Classes	2	-	-
Fitzgerald 1965	7, 8	172-Control 99-Experimental 271-Total	1	3	Bright students (IQ 115 or greater) in the control group scored significantly higher than the bright students in the experimental group.
Flournoy 1973	1	60-Control 40-Experimental 100-Total	4	-	The study took place in the mid-city "complex" schools in Los Angeles.
Frase 1971	Intermediate Level	30	No Significant Difference	No Significant Difference	Compared two individualized mathematics programs: Booklets for Individualized Progress (BIP) vs Guilded Discovery Units.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Fremont 1963	Geometry	112	2	2	The teacher who had experience with the individualized methods brought about significantly higher attitude changes than another teacher who had no experience.
Gadske 1933	Algebra I	23-Control 23-Experimental 46-Total	4	-	A one-year study.
Gaskill 1970	1, 2, 3	Not Given	2	2	Evaluated the IPI program as used in one elementary school in Urbana, Illinois.
Gibbs and Brgoch 1964	7, 9	9- Grade 7 18-Grade 9 27-Total	-	-	No control group; the 7th grade group used multi-level textbooks and the 9th grade group used programmed materials.
Glaser 1966	1 to 6	156	-	-	No control group; this study was an interim report on the IPI program at Oakleaf Elementary School, University of Pittsburgh.
Glavach and Stoner 1970	9, Low Achievers	24	Eleven students were assigned back to regular classes.	-	No control group; materials were selected to meet diagnosed needs of individuals and a system of tangible awards was used.
Godde 1972	k, 1	2-Control Classes 2-Experimental Classes	2	4	A significant difference in favor of the experimental group was also found for personal adjustment.
Graeber 1974	3 to 6	Not Given	-	-	Investigated diagnostic-test-based prescriptions vs teacher prescriptions in the IPI program.
Graham 1964	5,6	Not Given	-	-	No control group; 5th grade made a median score gain of 1.2 years in 8 months; 6th grade gained 1.6 years in 8 months. Teachers felt that there was an increased interest in mathematics.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Grant 1964	4, 5, 6	46-Control 41-Experimental 87-Total	2	-	A three-year program of individualized instruction for students in one class. Significant differences were found in some non-math areas favoring the experimental group: language, paragraph meaning, and word meaning.
Greathouse 1965	5, 6	Not Given	3	-	Groups compared were group-oriented meaningful vs individual-oriented meaningful vs drill-computation.
Gryde 1971	Secondary School	707 Students in Five Schools	-	-	No comparison group; this study investigated an audio-tutorial system in these subjects: Algebra I, Botany, Biology, Chemistry, and Business Education. The system was effective in providing for individualized instruction.
Guiler and Edwards 1943	7, 8	206-Control 206-Experimental 412-Total	4	-	The experiment concentrated on improvement of computational skills.
Hamby 1971	2	180	-	-	No control group; the study compared two models for individualizing instruction. The modified program of IPI mathematics was found to be feasible.
Hamilton 1928	6	16	-	-	No control group; the class made a median score gain of 1.45 grades in .75 of a year.
Hanneman 1971	10, Geometry	2-Control Classes 2-Experimental Classes	3	2	The experimental group used teacher designed learning activity packages.
Harper 1972	4, 5	4 Elementary Schools	4	-	This study compared the IPI mathematics program to another teacher authored program and to a control group. This study concluded that the school district should institute the IPI program system-wide.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Heiman 1970	Elementary	Not Given	-	-	No control group; studied the subject areas of mathematics and language arts. When teachers read and reacted to progress data in the students' presence, the students' performance rates increased significantly.
Helms 1973	3, 6	250-Control 250-Experimental 500-Total	2	-	Studied the IPI mathematics program.
Hirsch 1972	Algebra II	213	Guided discovery group was significantly better.	-	No control group; the groups that were compared were guided discovery vs individualized instructional packages developed in an expository format vs individualized instructional packages developed in a branching programmed format. The topic was complex numbers. Significant differences favoring the guided discovery group were also found for transfer, while no differences were found for retention.
Holste 1972	Elementary	7 Classes	-	-	Studied the IPI mathematics program. Compared four different treatments of the types of prescriptions given to students and found that no one treatment was superior, but the treatment that was most effective was the one which involved children in determining their own prescriptions.
Johnson 1972	1 to 6	3 Schools	-	-	This study was the third year evaluation of the Minneapolis IPI Mathematics Project. IPI students made similar or slightly better gains than students in the other comparison schools.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Jones 1948	4	125-Control 125-Experimental 250-Total	3	-	For students of average and below average IQ the results were significant in favor of the individualized group in arithmetic. For students with above average IQ the gains favored the control group but it was not significant.
Joyner 1973	Prospective Elementary Teachers	36-Control 17-Experimental 53-Total	2	2	The topic was numeration systems. Used a diagnostic pretest, and prescribed individualized assignments based on pretest errors and had students work with Dienes blocks for at most three days.
Kellett 1966	7, 8	686-Control 362-Experimental 1048-Total	2	Had a minimal effect on attitude.	This was an evaluation of a continuous progress program at Weston Junior High in Massachusetts.
Kissel 1970	5	1 Class	-	-	This study was concerned with the efficiency of two observational methods in observing an IPI mathematics classroom. Randomly selecting individuals rather than whole class observation was found to be more efficient.
Kochen and Dreyfuss 1972	College	1 Class	-	Many positive reactions and comments.	This special experimental course at the University of Michigan was designed especially to improve attitudes towards mathematics of non-math-science majors. Students met with an assigned tutor at least one hour a week where an individualized schedule for activities was agreed on and results were discussed.
Kontogianes 1973	Prospective Elementary Teachers	2 Classes	4	2	The topic was sets, set operations, and their application to non-metric geometry. There was also a significant difference favoring the experimental group for retention.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Kriewall 1969	-	None	-	-	Discusses applications of information theory and acceptance sampling principles to the management of individualized programs in mathematics education.
LaPlaca 1973	8	118	3	-	The experimental group had significantly higher application scores and approached significance on the total mathematics scores. However, the individual learning unit program was more costly.
Liguori 1973	College	43-Control 85-Experimental 128-Total	2	-	This study evaluated the Personalized System of Instruction (PSI) in a college business mathematics course.
Lindvall and Yeager 1965	1 to 6	Varied from 70 to 157	-	-	Investigated three ways of measuring the rate of learning in the IPI mathematics program. Concluded that it is not a general characteristic of the learner but that it is related to the specific learning task.
Lipson 1966	1 to 6	159	-	-	Investigated transfer and generalization in the IPI mathematics program. Gives evidence to support the conclusion that the probability of transfer increases as the student's background in arithmetic increases.
Lowerre 1972	2, 3, 4	Not Given	-	-	Developed individualized materials on two logic inference rules. The experimental group scored significantly higher on the two rules taught than did a group not having instruction on logic.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Malcom 1972	7, 8, 9	1-Control School 1-Experimental School	3	3	The experimental school used the individualized Omapac mathematics program. In achievement, significant differences favoring the experimental group were found for grade 7. In arithmetic skills significant differences were found for all three grade levels. Learning styles were also considered in this study.
Mayer-Oakes 1936	9 to 12	48	-	-	Investigated the Dalton Plan in all subjects at a small high school. Compared state examination scores to the previous year's results. Algebra remained the same while the percent passing in Geometry increased from 20% to 75%.
McDermott 1973	College Intermediate Algebra	58	-	-	Compared two audio-tutorial individualized learning systems. One system used student assistants who gave help to students and the other did not use the student assistants. Students who received no help from student assistants scored significantly higher.
McHugh 1959	4, 5, 6	886-Control 880-Experimental 1766-Total	3	-	This was a two-year study. The 1957-1958 school year being the control year and the 1958-1959 school year the experimental.
Meade and Griffin 1969	1 to 6	15-Control Classes 13-Experimental Classes	2	IPI students liked math better than non-IPI students	This study evaluated the IPI mathematics program. On IPI placement tests the IPI students scored significantly higher than did non-IPI students.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Miller 1974	College	4-Control Classes 4-Experimental Classes	3	2	Investigated a contract method of instruction in community college mathematics courses. Experimental group did significantly better in Mathematics for Business Majors and Mathematics for Elementary Teachers, but there was no significant difference in College Algebra and Analytic Geometry.
Moench 1962	4	1 Class	-	-	The class was taught traditionally and after a concept was taught, individualized practice work was provided and students were allowed to progress at their own rate.
Moncrief 1972	Elementary	Not Given	-	-	Investigated the pre-set performance levels associated with a selected group of instructional objectives in the Individualized Mathematics System (IMS). Only 15% of the criterion levels were the same as those established by the developers of IMS.
Morningstar 1965	K to 6	Approximately 450	All grade levels showed good progress.	-	No control group; studied the continuous progress plan at Aspen Elementary School in Aspen, Colorado.
Morris 1968	Senior High	Not Given	2	2	This study evaluated a five year individualized instruction program at Cedar City High School in Cedar City, Utah. Of the thirteen comparisons nine were not significant, three significantly favored the conventional approach, and one favored the individualized approach.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Morrison 1937	4	62-Control 75-Experimental 137-Total	2	-	The topic taught was multiplication. The gain in points from pre to post-tests were 66.83 for control and 71.85 for individualized group. However, over the summer the individualized group lost 12.12 points while the control group lost 20.83 points.
Nabors 1968	5	316	3	-	The topic taught was verbal problem solving. Significant gains were found for average boys in the individualized group.
Nanney 1973	7	155-Control 155-Experimental 310-Total	4	-	The study took place at Allapattah Junior High, Miami, Florida. No significant difference was found for self-concept scores.
Neufeld 1967	4, 5, 6	324	-	-	This study was concerned with the relationship of selected characteristics of pupils to achievement gain using the Individualized Mathematics Curriculum Project (IMCP) approach. The overall results indicated that there was no difference between the high and low achievement gain groups in personality variables. However, some differences were noted.
Neujahr 1970	6	1 Class	-	-	This study analyzed teacher-pupil interactions when instruction was individualized. Interactions were indeed different from lecture-discussion classes. Each of four pedagogical moves were used more equally by teacher and pupils in the individualized class. Girls differed from boys by making 70% more moves.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
New Mexico Western States Small Schools Project, Santa Fe. 1965	Algebra I	14	-	-	Used a programmed algebra course produced by Science Research Associates (SRA), at Dora High School, Dora, New Mexico. At the end of the year 10 students received credit, 3 students received credit by the tenth week of the following year, and one student withdrew.
Newman 1974	College	229	-	-	This study was concerned with initial attitude differences among successful, procrastinating, and "withdrawn from course" students in a Personalized System of Instruction (PSI) Statistics course. The interest factor differentiated the successful group from the withdrawal group. The procrastinators and the withdrawal groups had feelings of anonymity in their traditionally taught math courses.
Nix 1969	8	3-Control Classes 3-Experimental Classes	3	-	Students of average mathematics ability, students of below average IQ, and boys achieved significantly more under individualized instruction. The individualized group also showed a greater change to a more favorable attitude toward school and mathematics.
Oles 1971	3, 4, 5	238	-	-	This study investigated self-scoring behavior in the Individually Prescribed Instruction (IPI) program.
Olsen 1974	College Remedial Mathematics	2-Control Classes 2-Experimental Classes	2	-	-

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
O'Neill 1970	5 Disadvantaged	Not Given	1	2	The experimental group used a systems approach where materials on multiplication and division of fractions was used individually with a machine.
Penner 1972	Trigonometry	5-Control Classes 5-Experimental Classes	2	3	-
Peters 1938	Algebra I, Geometry, and Algebra II	40, Not Given, 50, and 2 Classes	3	-	Peters (1938) summarizes four studies on the contract method of teaching mathematics by four graduate students at the Pennsylvania State College which were written up as masters theses. The authors of the four studies were H. P. Breininger, Edwin W. Cruttenden, Grace Allan Wray, and George B. Williams. Breininger's study had some negative results, while the others had positive results.
Philips 1973	5, 6	39	No significant difference between the two methods.	-	Compared two types of individually Prescribed Instruction (IPI) programs: paper-pencil vs computer assistance (CAI).
Pigge 1972	7	303	-	-	Compared three types of individualizing instruction: 1) team-teaching, 2) a technological approach using one teacher, one teacher aide, and programmed materials with 30 teaching machines, and 3) a self-contained, one teacher approach. The self-contained classes were significantly higher than the other two approaches. No significant differences were found for attitudes.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Pond 1973	Prospective Elementary Teachers	145	-	-	This study investigated the philosophical and psychological bases for implementing the concept of an individualized approach in education. It concludes that there does exists a reputable body of knowledge in support of individualized instruction. The study was also concerned with the effect on attitudes toward individualized instruction of prospective elementary teachers who studied under this approach. This did have a significant positive effect upon the students' attitudes toward individualized instruction.
Putbrese 1971	4	1 School	2	-	Groups compared were whole group vs multi-group vs individualized.
Redbird 1964	4	32	-	-	No control group; this article described a two-year project in the Campus Elementary School at Oregon College of Education. No child at the end of the two-year period was reading below a 6.3 grade level, and no child was below a fifth grade level in arithmetic.
Regula 1972	Educable Mentally Retarded Students Ages 8-12	38	2	-	The DOT overlay technique was used to teach addition skills under two approaches: group instruction and individual instruction.
Rosner 1973	K, 1	211	-	-	No control group; data for this study covered a five year period at the kindergarden and 1st grade level in a developmental school sponsored by the Learning Research and Development

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Rosner (Continued from previous page) 1973					Center, University of Pittsburgh. The adaptive instructional program which was designed to accommodate individual differences significantly increased achievement.
Salzberg 1972	Elementary	20	-	-	This study investigated the effects of making free time away from class contingent on the rate of academic progress in math. Nineteen students out of 20 increased their rate of progress.
Scanlon 1966	5, 6	50	-	-	Investigated the relationship between individualized instruction and self-initiation at Oakleaf Elementary School under the Individually Prescribed Instruction (IPI) program. The general finding was that a highly individualized classroom environment does encourage self-initiated learning behavior.
Schaefer 1972	7, 8	311 (2 Schools)	1	-	This study found that achievement in mathematics was affected by the method of teaching. A significant increase in achievement was found to have taken place in one seventh grade group taught under the traditional approach. There was no significant difference for self-esteem.
Schoen 1974	College Freshman; Elementary Education Majors	33-Control 37-Experimental 70-Total	2	-	Combined the individualized method with the lecture method. Experimental group had a higher mean score on the final examination but it was not significantly higher. Students seemed to prefer the experimental approach (56%-Yes; 35%-No).

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Schultz and Chlsen 1949	9, Algebra I	19-Control 19-Experimental 38-Total	2	-	Conducted the experiment twice, the first was one year in length, while the second was only one semester. Using matched pairs, in both experiments the experimental group had higher (but not significant) mean scores than the control group.
Shumaker 1972	7	57-Control 57-Experimental 114-Total	2	-	This study compared seventh grade students who had Individually Prescribed Instruction (IPI) in their elementary education with students who had the traditional approach in elementary school. Study habits and study attitudes were nearly significant (8% level) in favor of IPI group.
Sganga 1960	6	20	-	-	No control group; a gain was made of 1.4 years in seven months.
Singh 1969	4, 5, 6	2 Schools	-	-	Studied the effects of giving individualized enrichment homework. The control group was taught by the traditional method but gave no homework at all. The experimental group showed significant achievement on the arithmetic subtests of the Stanford Achievement Test.
Sinks 1968	7	108	2	-	Investigated individually prescribed curriculum in the areas of mathematics, science, social studies, and language arts.
Smith 1972	College Elementary Education Majors	48	2	-	Compared teacher demonstration vs self-paced learning. No difference was also found for retention.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Snyder 1966	7, 8	1 School	2	2	Studied two self-selection-pacing approaches to individualizing instruction. In one group students could chose a conventional teacher-taught approach or topics of interest and value to themselves. In the other group, students were required to participate in a teacher-taught class but could chose the level of assignments which seemed appropriate to them. In both programs the emphasis was on independent study with the teacher as a resource person.
Spraker 1960	See Banghart and Spraker which was cited earlier.				
Suppes 1964	1	40	-	-	No control group; mean IQ was 137. In seven weeks, all students finished the two first grade workbooks which constituted the full first grade curriculum. Fastest student solved about 3400 problems and the slowest solved about 2200 problems.
Sutton 1967	7	735-Control 991-Experimental 1726-Total	1	-	A year long project in the Volusia County, Florida school system.
Taylor, D 1972	2, 4, 6	2 Schools	2	-	Evaluated the Individually Prescribed Instruction (IPI) program in two inner-city elementary schools in the Cleveland Public School System. On eight subtests on achievement 3 favored IPI, 3 favored the control group, and on 2 neither was favored. On a longitudinal achievement comparison, out of 8 subtests, none favored IPI, 3 favored the control group, and on 5 neither was favored.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Taylor, L 1971	Algebra I	23-Control 25-Experimental 48-Total	2	2	Students progressed individually through independent study for one semester.
Thomas, Bonnie 1972	5, 6	373	1	3	Evaluated the Individually Prescribed Instruction (IPI) program in Urbana Schools, Illinois. The sixth grade IPI group had a significantly more favorable attitude toward math.
Thomas, Buren 1971	Advanced Algebra	145-Control 135-Experimental 280-Total	2	2 Both groups had attitude decrease.	Investigated the continuous progress program in two schools in Lincoln Public Schools, Nebraska.
Thompson, R 1941	7	56-1st Year 38-2nd Year 35-3rd Year 129-Total	4	-	Experiment took place in the Training School of the University of Utah. A control group was only used in the first year of the experiment. In the 1st year over a ten week period the experimental group gained 1.41 years in arithmetic while the control group gained .4 of one year. In the 2nd year, again the group gained 1.4 years in ten weeks. In the 3rd year, the experiment was done for a full year and the group made an average gain of 2.6 years
Thompson, W 1933	5, 6, 7, 8	232-Control 100-Experimental 332-Total	2	-	Evaluated the Dalton Plan used at the Ohio State University Demonstration School.
Tilton 1947	4	19-Control 19-Experimental 38-Total	4	-	For four weeks, in the experimental group students spent 20 minutes per week on a one-to-one basis with the teacher working on diagnosed weaknesses in arithmetic. Hence with only 80 minutes of personalized instruction the experimental group made five months more progress than the control group.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Tychsen 1971	1 to 6	359	2	2	Experiment took place in the Greenwich Public Schools in Connecticut. Grade two had positive results in attitudes for the experimental group.
Verneul 1971	6	262-Control 192-Experimental 454-Total	1	-	Investigated Individually Prescibed Instruction (IPI) program in an experimental school in northern Florida. No significant difference was found for self-concepts.
Wasden 1971	Elementary	Not Given	1	-	Compared traditional elementary schools with individualized schools. In general, control students scored higher in arithmetic skills, and experimental students scored higher in language arts.
Washburne 1927	9 to 12	1399	4	-	A follow-up study of the students in high school who had been educated in the Winnetka public school system in grades 1 to 8 which provided for individual progress in the academics.
Weinberger 1969	1 to 5	1231	-	-	Investigated the need to take placement tests in the fall after a summer recess in the Individually Prescribed Instruction (IPI) program. It found that it was unnessary.
Wheaton 1971	High School	2 Schools	1	-	Evaluated the individualized learning program in the Santa Maria Joint Union High School District in California. Investigated three areas: English, basic mathematics, and general science. Traditional group gained significantly more in arithmetic applications.

Author and Date	Grade Level or Subject	Sample Size	Achievement Rating	Attitude Rating	Additional Comments
Whipple 1972	8	93	-	-	Compared the laboratory approach vs individualized instruction (the control group).
Williams, B 1973	4, 5, 6	1 Control School 1 Experimental School	4	2	Evaluated a continuous progress plan in reading and mathematics. No difference was found in reading but a significant difference was found in favor of the experimental group in mathematics.
Williams, H 1930	Delinquent Children Ages 8 to 16	13	-	-	This was an experiment in self-directed education; no formal instruction was given and social adjustment was more important than academic work. Arithmetic age gained an average of 14 months in 4 months.
Wolff 1968	Elementary Teachers	20	-	-	Compared individualized instructional practices in arithmetic by teachers in graded and nongraded classrooms. It was found that graded and nongraded teachers individualize their arithmetic instruction in similar ways.
Wood 1972	7, 8, 9 Educable Retardates	29 in Experimental group, number in control group was not given.	2	-	Used the Individually Prescribed Instruction (IPI) program.
Zahorik 1969	Fourth Grade Elementary Teacher	1 Teacher with 23 students.	-	-	Observed five individual and four group mathematics lessons taught by the same teacher. During the individual lessons there was more teacher talk, less use of higher thought level solicitations, and less use of a variety of logical operation solicitations than during group instruction.

Table 2

Grade Level Distribution Chart for Individualized Mathematics Instruction

	ACHIEVEMENT					ATTITUDE				
Grade Level	0	1	2	3	4	0	1	2	3	4
Preschool			1							
K, 1*			1							1
1				1						
2										
2										
1, 2, 3			1	1				1		
4			2	2	2					
1, 2, 3, 4			1					1		
3, 4, 5			1							
4, 5				1						
5		1	1	1	1			2		
3, 4, 5, 6		1								
2, 4, 6			1							
3, 6			1							
4, 5, 6			1	1	1			1		
5, 6		1		1					1	
6		1	2					1		
1 to 6			2					1		
Elementary Ungraded (Central, Saturday Class 2 to 12		2		1	1			1		1
1, 2, 4, 5, 6, 7, 8		1						1		
5, 6, 7, 8			1							
Elementary Totals:	2	6	17	7	7	0	0	9	1	2

* Combined grade levels indicate such combinations by individual researchers.

Table 2 (Continued)

	ACHIEVEMENT					ATTITUDE				
Grade Level	0	1	2	3	4	0	1	2	3	4
7		1	5		3	1		2		1
8	1		2							
7, 8		2	4		1			3	1	
9										
9, General Math			1		1			1		
9, Algebra I	1		2					1		
Algebra I			2		1			2		
7, 8, 9				1					1	
7, 8, 9 Educable Retardates			1							
Junior High					1					
General Math					1					
Geometry			1	2	1			2		
Algebra I, Geometry, Algebra II				1						
Trigonometry			1						1	
Advanced Algebra			1					1		
9 to 12					1					
Senior High		1	1					1		
College			4	1				1		
Prospective Elementary Teachers			2		1			2		
Secondary Totals:	2	4	25	7	11	1	0	16	3	1
Elementary Totals:	2	6	17	7	7	0	0	9	1	2
(previous page) Grand Total:	4	10	42	14	18	1	0	25	4	3

Table 2

Distribution by Year Chart for the Individualized Mathematics Instruction Studies

Achievement Scores

Year	No Score	0	1	2	3	4	Total
1974	2			4	1		7
1973	6		1	4	2	5	18
1972	12		2	12	1	2	32
1971	5	2	3	4	2	2	18
1970	6		1	2			9
1969	4	1	1	1	1	3	11
1965-1968	12		2	8	2		25
1960-1964	7			4			11
1950-1959					1	1	2
1940-1949				1	1	3	5
1930-1939	3	1		2	2	1	8
1920-1929	1					1	2
Total:	57	4	10	42	14	18	145

Table 4

Individually Prescribed Instruction (IPI) Studies

Author	Date	Achievement Rating	Attitude Rating	Comments (If Any)
Accarto	1970	-	-	Students were mentally retarded
Beilfuss and Pastro	1969	1	4	2nd year evaluation
Bolvin	1968	-	-	Investigated variability of achievement
Chatterly	1970	-	-	Compared four modes
Church	1971	2	-	1st grade did well
Deal	1966	-	-	Controlled ability levels
Fernandez	1970	-	-	Analyzed prescriptions
Fidler	1971	0	-	Evaluated same group two years later
Fisher, L.	1969	2	-	
Gaskill	1970	2	2	
Glaser	1967	-	-	Interim report
Greeley	1971	-	-	Analyzed prescriptions
Hardy	1971	-	-	
Hauser	1970	4	-	
Hoke	1969	2	-	
Holste	1972	-	-	Investigated types of prescriptions
Johnson	1970	-	-	3rd year evaluation
Kissel	1970	-	-	Investigated observing methods
Lindvall and Hauser	1965	-	-	Investigated rate of learning
Lisser	1971	-	-	Transfer
Nesbit and Calfee	1969	2	-	
Olea	1971	-	-	Investigated self-scoring behavior
Phillips	1972	-	-	Compared with CAI
Pooper	1972	-	-	Covered a 5 year period
Scanlon	1966	-	-	Investigated self-initiated behavior
Shockley	1969	2	-	
Snyder, J.	1969	2	-	
Thorne, Harold	1970	1	2	
Vorhaus	1971	1	-	Self-concepts = 2
Wehrheimer	1969	-	-	Investigated the need to take placement tests after a summer recess
Worl	1972	2	-	

Achievement average = 24/13 = 1.85

Table

Time Length of Studies Compared With Achievement

Less Than A Semester	Score	Semester	Score	Year	Score	Longitudinal	Score
Donegan	2	Amendola	1	Abate	2	Bailek and Castro	1
Joyner	2	Baley and Benesch	4	Alschuler	4	Fielder	0
Kentopianes	4	Bartel	3	Ball	2	Grant	2
Miller	3	Basik	2	Bernstein	4	Helms	2
Nguyen	2	Beul	4	Bierden	2	Morris	2
Thompson, W.	3	Broussard	4	Brust	2	Shumaker	2
Tilton	4	Concannon	2	Bull	4	Taylor, D.	2
Tychsen	2	Englert	2	Clough	3	Thomas, Bonnie	1
		Flournoy	4	Cohen	2	Thompson, R.	4
		Guiler	4	Crosby	2	Washburne	4
		Liguori	2	Drake	0		
		Morrison	2	Ebeid	2		
		Nabors	3	Eilberg	3		
		Olsen	2	Forney	0		
		Penner	2	Fitzgerald	1		
		Schoen	2	Fremont	2		
		Schultz	2	Gadske	4		
		Smith	2	Gaskill	2		
		Taylor, L.	2	Jones	3		
				Mallett	2		
				Malcom	3		
				Mellugh	3		
				Meade	2		
				Nix	3		
				Puttrese	2		
				Sinks	2		
				Snyder	2		
				Sutton	1		
				Verheul	1		

Less Than A Semester Average = 22/8 = 2.75

Semester Average = 49/19= 2.58

Year Average = 65/29= 2.24

Longitudinal Average = 20/10= 2.00

Table 6

Studies That Considered Ability Levels

Definition of code symbols:

- = Study not comparable

0 = No ability group favored

H = High ability group in individualized method favored

Av = Average ability group in individualized method favored

L = Low ability group in individualized method favored

HC = High ability group in control sample favored

AvC = Average ability group in control sample favored

In the chart on the following page, the number of studies found for each category defined above is stated after the appropriate code symbol:

- = 9

0 = 12

H = 5

Av = 7

L = 9

HC = 2

AvC = 1

Table 6

Studies That Considered Ability Levels

Author	Achievement Rating	Group Favored (Individualized Over Control Unless Otherwise Noted)	Code
Arwants	-	Positive Implications for low ability (mentally retarded)	-
[illegible]	1	None	0
Boley and Symonds	4	Low (General Math)	L
Ball	2	None (General Math)	0
Bernstein	4	Low (General Math)	L
Bradley	-	High ability group favored in individualized homework assignments	-
Broussard	4	Low	L
Chatterley	-	Average and low groups benefitted from a multimedia mode using immediate correct answer feedback	-
Clough	2	High	H
Cohen	2	None	0
Crangle	0	No difference for low I.Q. students	0
Deep	-	IPI program did not operate differentially on different ability groups	-
Drake	0	For both high and average ability groups, the group method was better	HC, AvC
Eastwood	2	Average	AV
Connell	2	No difference for low achievers	0
Fitzgerald	1	High (IQ = 115 and above) - Conventional method was better	HC
Gedeke	4	High, Low	H, L
Gockill	2	Low ability group was favored for attitudes and self-concepts	L
Gutler	4	High, Average, Low	H, Av, L
Hagaman	2	None	0
Helms	2	Low 3rd graders benefited least, low 6th graders benefited most	0
Hess	3	Average, Low	Av, L
Hirsch	3	High, Average	H, Av
Hench	-	High and low ability groups were favored in individualized remedial work	-
Horningstar	-	The slower and faster students seem to profit most by the individualized program	-
Hubers	2	Average	Av
Hunter	4	High, Average, Low	H, Av, L
Hut	3	Average, Low	Av, L
Pirne	-	Average group was favored in the individualized self-contained, one-teacher approach; low group was favored for applications in the individualized team-paced approach	-
Reuda	2	No advantage for mentally retarded group	0
Smith	-	No difference due to intelligence level	-
Thurber	-	High ability students finished last made most in 2 weeks	-
Tuttle	4	[illegible]	0
Wadley, R.	2	No difference for [illegible]	0
Walker	4	[illegible]	0
Wood	0	Individualized more beneficial	0

Achievement Average For The Above Studies = 2.41

Table 2

Sex Differences

Author	Year	Achievement Rating	Code	Comments (If Any)
[illegible]	[illegible]	-	0	-
[illegible]	[illegible]	4	0	-
[illegible]	[illegible]	2	0	-
[illegible]	[illegible]	2	0	-
Cancannon	1966	2	BG	Girls achieved higher mean scores than boys in 4 out of 5 tests
[illegible]	[illegible]	-	0	-
Forney	1969	0	GW GB	Project PLAN
[illegible], W.	1966	2	0	-
Fitzgerald	1965	1	GW	Girls were more industrious, less active, and more alone than were the boys
[illegible]	1959	3	0	Boys made greater improvement than girls in grades 4 and 5; the reverse was true in grade 6
[illegible]	[illegible]	2	BG	-
Neujahr	1970	-	GW	Average girl made 70% more moves than the average boy in this study on teacher-pupil interactions
Nix	1969	3	BG	-
Oles	1971	-	0	Self-scoring behavior in the IPI program
Phillips	1973	-	0	Compared CAI vs paper and pencil in the IPI program
Scanlon	1966	-	0	Self-initiation within IPI program
Singh	1969	-	0	Individualize enrichment Homework
Snyder	1966	2	BW	Boys worked more independently than did girls in one type of experimental method
Vorhaul	1971	1	0	-
Williams, R.	1973	4	0	-

Achievement Average for the Above Studies = 30/13 = 2.31

Definitions of Codes:

0 = No difference between girls and boys
GT = Girls in the experimental group did better than girls in the control group
GW = Girls in the experimental group did better than the boys in the experimental group
BG = Boys in the experimental group did better than boys in the control group
BW = Boys in the experimental group did better than the girls in the experimental group
CB = Control boys did better than the experimental boys
NC = Not Comparable

Table 8

Summary Chart of the Narrative Studies on Individualized Instruction

Author	Year	Grade Level	Sample Size	Achievement Rating	Time Length
Arsenlola	1972	1, 2, 4, 5, 6, 7, 8	560	1	S
Bellek and Castro	1969	Elementary	8 Schools	1	L
Crandle	1971	8	62	0	-
Drake	1935	9, Algebra	44	0	Y
Feney	1969	5	271	0	Y
Fielder	1971	3,4 in 1968 5,6 in 1970	Not Given	0	L
Fitzgerald	1965	7, 8	271	1	Y
O'Neill	1970	5 Disadvantaged	Not Given	1	-
Schaefer	1972	7, 8	311	1	-
Sutton	1967	7	1726	1	Y
Thomas, Bonnie	1972	5, 6	273	1	L
Verheul	1971	6	454	1	Y
Vanden	1971	Elementary	Not Given	1	-
Wenton	1971	High School	2 Schools	1	-

Time Length Code:

S = Semester

Y = Year

L = Longitudinal

Table 2

Summary Chart of the Positive Studies on Individualized Instruction

Author	Year	Grade Level	Sample Size	Achievement Method	Time Length
Alcander	1969	5	90	4	Y
Bailey and Jamerson	1969	General Math (Gr. Math)	90	4	S
Bullard	1965	5	2 Classes	3	-
Countain	1974	9, General Math	103	4	Y
Ewell	1973	2	101	4	-
Fairfield	1973	Elementary	2 Schools	4	-
Greenwood	1971	4	102	4	-
Hartland	1969	Junior High	1 Classes	4	-
Hull	1971	High School Geometry	4 Classes	4	Y
Hunt	1971	1, 2, 3	300	3	Y
Kilpatrick	1971	Chemistry	80	3	Y
Miller	1973	Elementary	Not Given	3	-
Mulvaney	1973	1	100	4	Y
Osborne	1969	Algebra I	86	4	Y
Overthouse	1973	5, 6	Not Given	3	-
Phillips and Stevens	1969	8, 9	140	3	Y
Thompson	1971	10, Geometry	4 Classes	3	Y
Tuck	1969	4, 5	2 Schools	4	-
Wells	1969	4	250	3	Y
Wente-Lonas	1973	Prospective Elementary Teachers	2 Classes	4	IS
Adams	1973	8	120	3	-
Allen	1969	2, 3, 4	2 Schools	3	Y
Allen	1969	4, 5, 6	1844	3	Y
Amyx	1974	Chemistry	6 Classes	3	IS
Arbogast	1974	3	240	3	S
Barnes	1973	8	240	4	-
Bell	1970	8	4 Classes	3	Y
Peters	1973	Algebra I, Geometry, Algebra II	40, 30, 2 Classes, Not Given	3	-
Brown, J.	1974	7	110	4	Y
Brown	1969	4	28	4	Y
Cochrane	1973	9 to 12	1372	4	Y
Williams, J.	1973	4, 5, 6	2 Schools	4	-

Time Length Code:

IS = less than a semester

S = Semester

Y = Year

I = Longitudinal